DECEMBER 1958

PRECISION METAL MOLDING

INCLUDING DIE CASTINGS MAGAZINE

DIE CASTINGS
INVESTMENT CASTINGS
POWDER METALLURGY
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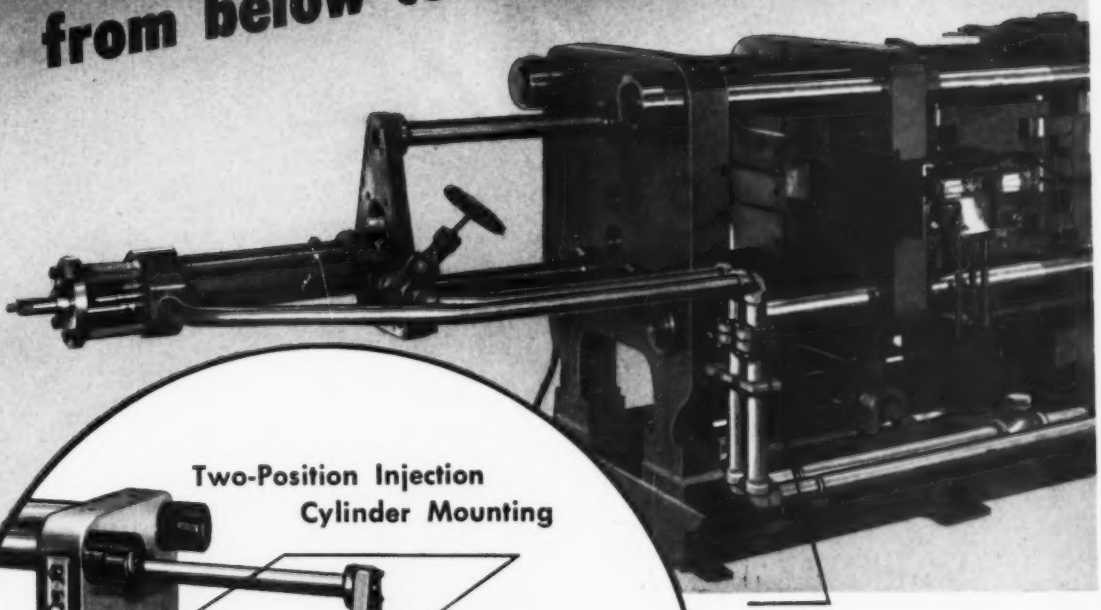

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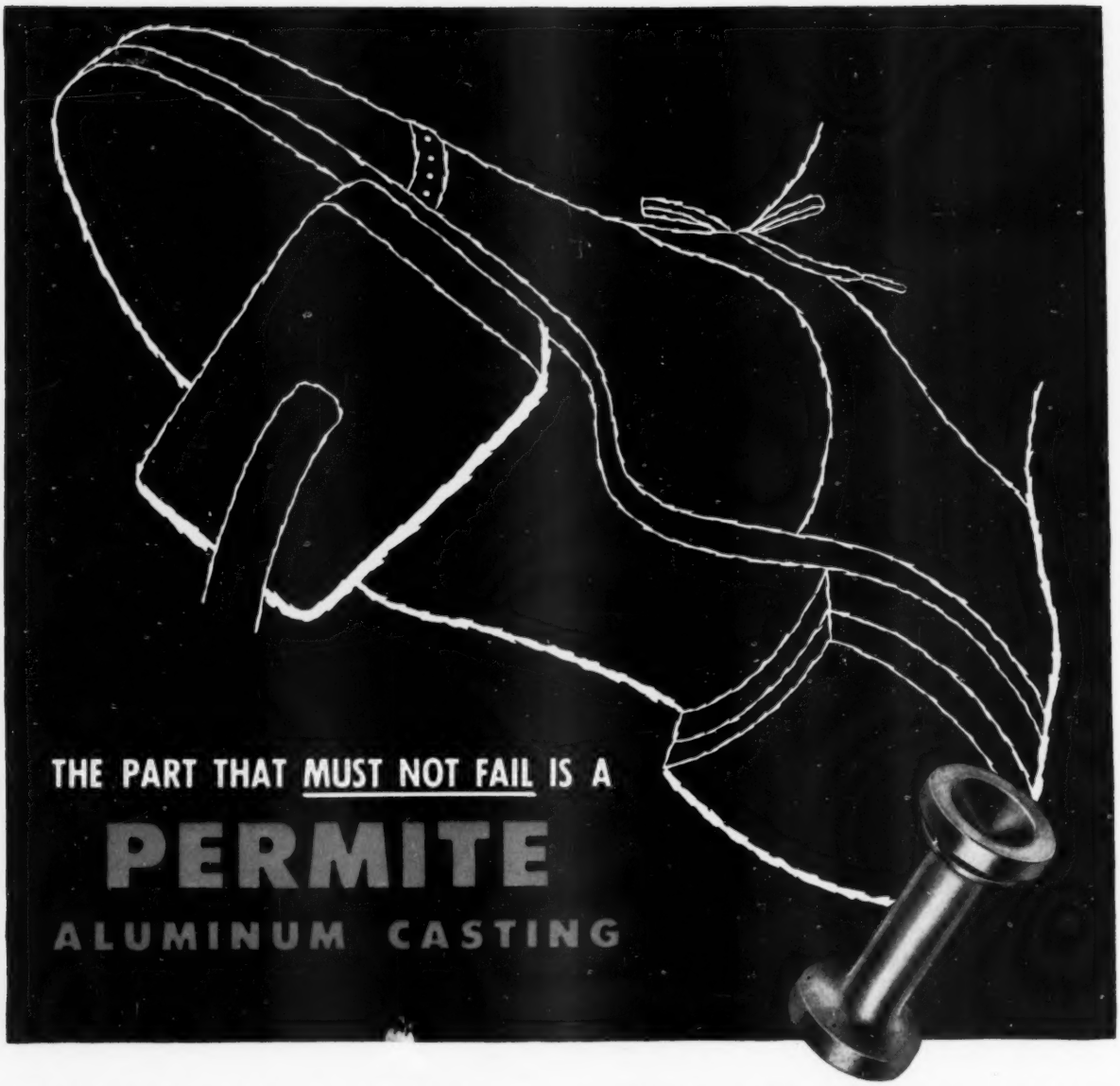

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Vol. 11 No. 12

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LETTERS TO THE EDITOR

IMPREGNATING CASTINGS

The article by Carl F. Olson in your September issue on "Comparison of Casting Impregnants," while excellent in presentation and subject matter, casts some doubt on the use of polyester-styrene resins as impregnants. In an article published in Metal Progress, April, 1953, the writer discussed the development of a new type of polyester-styrene resin for impregnation of all metals. This particular polyester-styrene resin needs no refrigeration or aeration, and for this reason, the viscosity can be accurately controlled. This resin has polar groups which make it "wetter" to metal and insure penetration into the smallest micro-pore. It cleans completely without ionic interchange in both non-ionic water base cleaners, and in inhibited high pH cleaners containing non-ionic detergents. This makes the use of highly toxic methylene chloride or highly inflammable acetone unnecessary.

The flash point of most polyester-styrene resins is higher than indicated in Mr. Olson's article, unless run under closed cup conditions. Under operating conditions examination of the fire hazard with an explosion meter by competent testers from many fire departments has shown no danger to exist. A properly designed system allows practically no impregnant exposed at any time. Actual experience with many aluminum and magnesium castings has shown that a high sealing rate is achieved by using properly developed stryene-polyester impregnants in properly constructed and operated systems,

continued next page

You Don't Have To Make Large Capital Investments In New Equipment

. . . to get complex parts like these

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Like Two Peas in A Pod—

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DIE CASTING DIES

(The die above shows on the left the upper section and on the right the lower section is shown assembled with cavities and gating.)

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LETTERS TO THE EDITOR
continued from page 5

without refrigeration or the inhibiting effect of aeration. —W. N. P. (Research Director)

Impregnation of non-ferrous castings has become of great interest during the past couple of years, due to the increasing demands which designers are placing upon die cast components. This is especially true of components used in hydraulic systems, pumps, aircraft components and various types of sealed systems. — Ed.

SOURCES . . . SOURCES

We are seeking sources for the making of magnesium die castings and believe that you may be of assistance to us by either advising us whom you know is producing these castings or suggesting a source which we might contact. — O. R. S.

Please forward a list of foundries, using the Shell Molding process, who would be in position to quote prices on S. A. E. 40 (85-5-5-5) bronze castings. — G. G. (Engineering Department)

We are interested in locating any molding or casting firm that is presently producing the outer housings for small speakers that are used in outdoor theaters. Do you have any listing of suppliers? —P. E. W. (Material Director)

If at all possible we would appreciate having names of foundries using the shell molding process who would accept orders for castings in aluminum, bronze and grey iron. Should you have any other pertinent information concerning the above we would also like to have you forward this. — W. S. D. (Purchasing Agent)

It would be interesting to us if you could supply a list of

continued on page 10

CUT PARTS COST *with* DOLLIN Zinc & Aluminum DIE-CASTINGS

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WHY ALDRICH PUMPS CUT FIRE RISKS

● It's simple. With Aldrich Pumps *water* can be used as hydraulic medium, as well as oil. With water, you eliminate chances of plant damage or injuries due to oil fire.

Fire "insurance" like this is important. But so are the many other advantages you'll get when you specify Aldrich Pumps. Here are a few of them:

MORE POWER

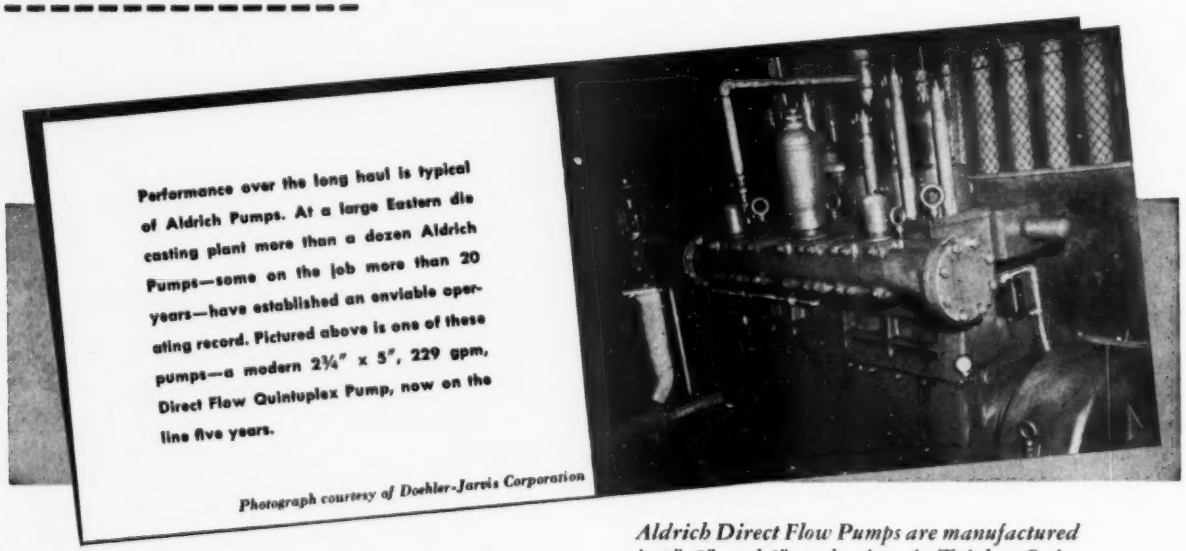
Higher operating speeds afford greater *volumes* and *pressures* from smaller, more compact pumps.

SIMPLE MAINTENANCE

Fluid ends are sectionalized . . . parts can be replaced easily and at low cost. To facilitate changes in pressure and volume requirements, *plunger sizes are easily changeable* . . . in most cases changing them is simply a matter of using new glands, throat bushings and packing in the same fluid end. And, *wearing parts are interchangeable* . . . helping to reduce spare parts costs and inventories particularly when combinations of multiplex pumps are employed.

These are *all* good reasons why Aldrich Pumps have proven their worth over the years with many die casting manufacturers. They are good reasons, too, why you should get more information about Aldrich Pumps.

Write us for catalogs, engineering service, or a representative's call. We invite your inquiries for pumps or complete central hydraulic systems.



Performance over the long haul is typical of Aldrich Pumps. At a large Eastern die casting plant more than a dozen Aldrich Pumps—some on the job more than 20 years—have established an enviable operating record. Pictured above is one of these pumps—a modern 2¼" x 5", 229 gpm, Direct Flow Quintuplex Pump, now on the line five years.

Photograph courtesy of Doehler-Jarvis Corporation

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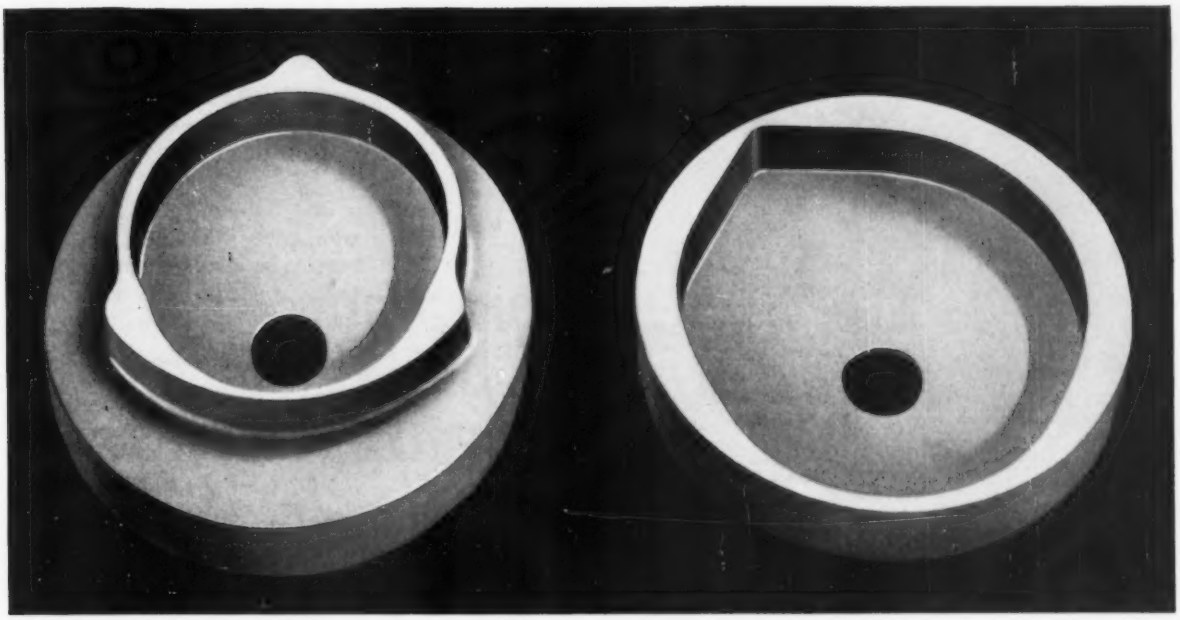

front view *rear view*

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LETTERS TO THE EDITOR
continued from page 6

companies now doing brass die casting so that we may contact them regarding their producing brass die cast parts for us. — H. J. W.

Please advise if you could let us have the addresses of firms doing powdered metal molding of porous materials that can be used for filtering purposes. — D. W. B.

We note in your "Letters to the Editor" in the November issue of Precision Metal Molding a request for the names of foundries using the Shell Molding Process who would be interested in accepting orders. We too are interested in contacting companies using this process, and wonder if you would be so kind as to send us a similar list, limited to those companies furnishing ferrous, and more particularly malleable shell-molded castings.

We find your publication "Precision Metal Molding" very informative and helpful. — R. G. F. (Vice President, Engineering).

In your November issue under Letters to the Editor, you mention W. S. M. Development Metallurgist who claims to make precision castings in excess of 200 pounds. We would like to have the address and company of W. S. M. — R. G. M. (President).

These above several inquiries are typical of letters received looking for sources of supply for types of castings. Information is forwarded in each case. — Ed.

HERE'S YOUR GUIDE TO IMPROVED SHELL MOLDING WITH BR-12011S

"BAKELITE" SHELL MOLDING RESIN BR-12011S PROVIDES:

- **Faster production of molds**
- **Improved adhesion of resin-sand mixture to pattern plates**
- **Stronger molds that resist distortion upon ejection from pattern plate**

GET THE STORY FROM THIS BULLETIN ... BAKELITE Shell Molding Resin BR-12011S has been specially developed to give greater latitude in mold-making. It can be subjected to a greater variation in operating conditions than ordinary shell molding resins. Molds made with BR-12011S reach minimum usable strength faster, retain strength longer at curing temperatures, permit more leeway in curing time.

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Please send me complete information on shell molding resin BR-12011S, together with the basic story of shell molding with BAKELITE Phenolic Resins.

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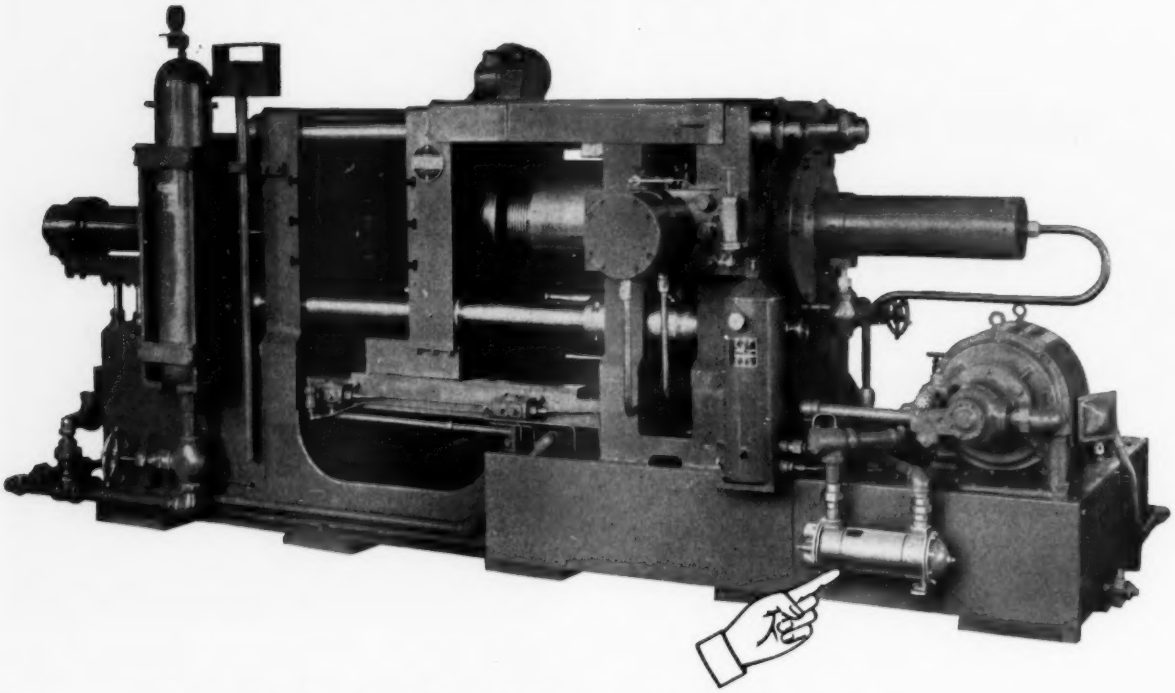
controlling oil temperature to insure steady holding pressures



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Though we do not supply pressure cast molds, we furnish Berylco ingots to mold makers throughout the world. Plan now to increase your range of alloys; send for your trial order today. Send also for your free copy of the recently published Product Directory. It contains the most complete listing of available forms of beryllium copper.

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Between the Lines

in this and future issues of PMM

HOW TOUGH IS A DIE CASTING? The answer is, "Plenty!" Take a look at some of the successful applications of die castings described in this issue.

TRUCK CASTERS . . . Quiet, free-rolling truck casters of a new design are built of a pair of zinc or aluminum die castings. Impact resistance and durability are essential factors. See page 33.

TRIGGER GUARD . . . A shotgun made by a leading manufacturer has replaced a malleable iron trigger guard with a zinc die casting. Equal strength at lower cost is the reason. See page 44.

OUTDOOR LAMP SUPPORT . . . The connector for an outdoor flood lamp is die cast in zinc, finished by painting. Exposure to weather does not impair these castings. See page 52.

PENCIL SHARPENER . . . Main support column of a pencil sharpener does not need to meet impact or shear stress, but it does have to support a cantilever load. Thin-walled, economical zinc die castings do the job and have long since proved themselves equal to the task. See page 53.

PORTABLE TOOLS . . . Chain saws and other portable tools that get plenty of banging in normal usage, are now being built with die cast magnesium housings. See page 40.

WHAT'S YOUR GUESS . . . concerning the fastest growing use for magnesium? Some figures and facts that will answer this question for you appear on page 39.

New Hydraulic Fluid Won't Burn or Explode!

5 years in the lab...
2 years in plant use!

Conventional Oil Burns Instantly. An atomized jet of regular hydraulic oil pressure-sprayed into flame from a blow torch ignited immediately into an 8-foot blaze.

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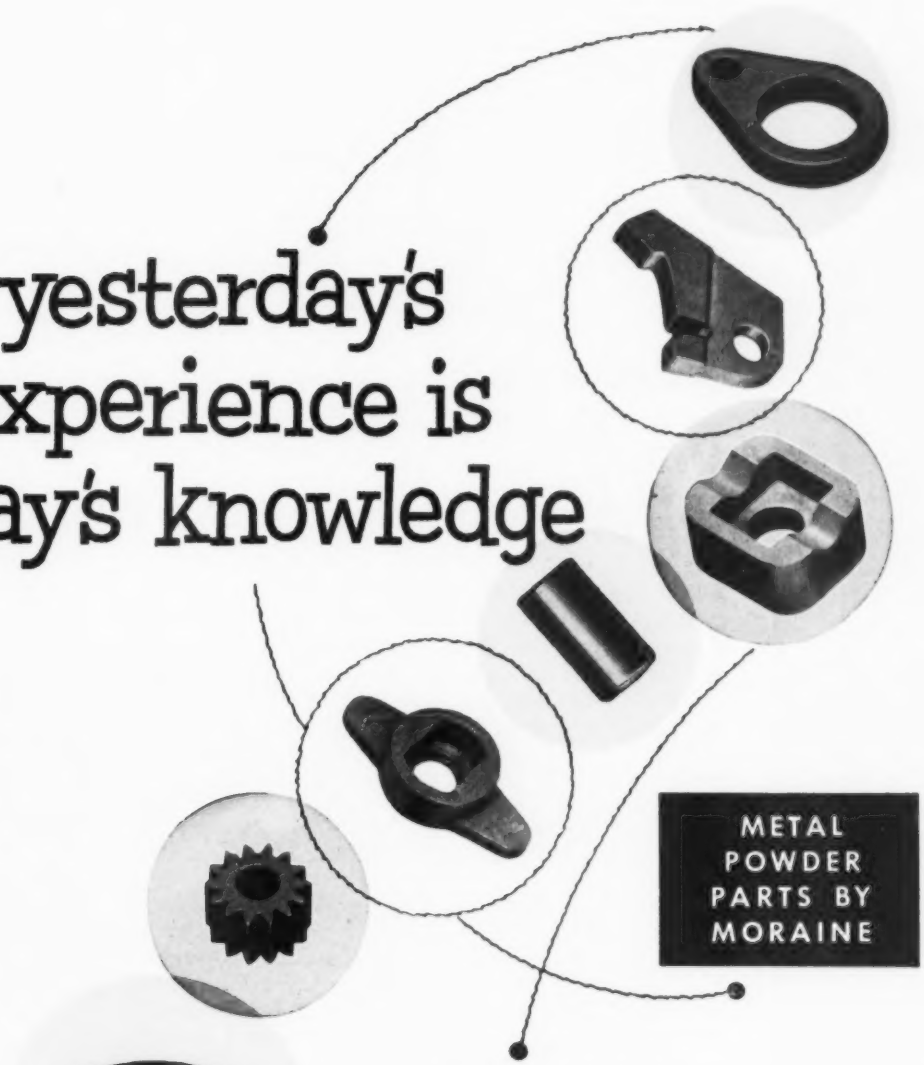
yesterday's experience is today's knowledge



METAL POWDER PARTS BY MORAINE

While we've had a large amount of experience (over a quarter century) in making *billions* of metal powder parts, there seems to be no limit to our learning. Always there is something new to learn, something valuable to add to our already vast store of knowledge on the subject of powder metallurgy.

We find new ways to improve the physical properties of our metal powder parts; we see a constant broadening in the range of materials we can offer our customers; and the number of applications for our metal powder parts grows with our knowledge.

We're proud of the position we've reached in the field of powder metallurgy . . . but no prouder than we are of the way our products are able to serve industry by improving performance while cutting costs.

moraine products

DIVISION OF GENERAL MOTORS CORPORATION, DAYTON, OHIO

U.S. ZINC CONSUMERS... *which would you prefer?*

A brief study of these curves showing domestic slab zinc production in its relation to imports reveals some facts of interest to every consumer: In periods of greatest necessity, imports of zinc are at their lowest, as for example in 1948 and 1951. Conversely, when there is an abundant supply, imports are at their highest level. As a result, prices decline and domestic zinc production is discouraged – *production which may be vitally needed on very short notice.* As a matter of fact, the alternate withholding and flooding of the domestic market with foreign zinc has been responsible for some of the wide fluctuations in the domestic price which is so disturbing to the American consumer.

The price concessions offered by importers in easy markets rarely offset the premiums or inconveniences caused by lack of availability of the same metal in tight markets. Furthermore, many grades of imported zinc are not comparable in quality to primary domestic brands produced to A.S.T.M. specifications. In other words, it is not a question of dollars and cents alone.

For reliability of supply and unquestioned quality –
SPECIFY DOMESTIC ZINC

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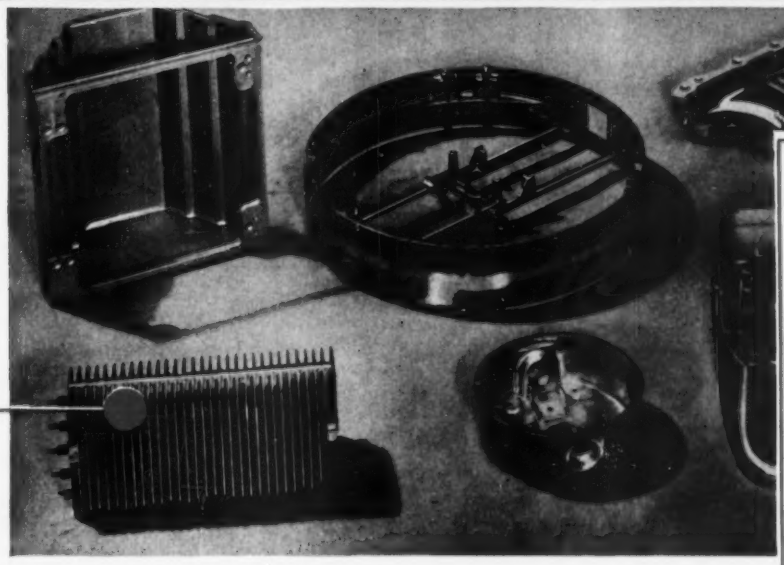
250 PARK AVENUE, NEW YORK 17, N. Y.

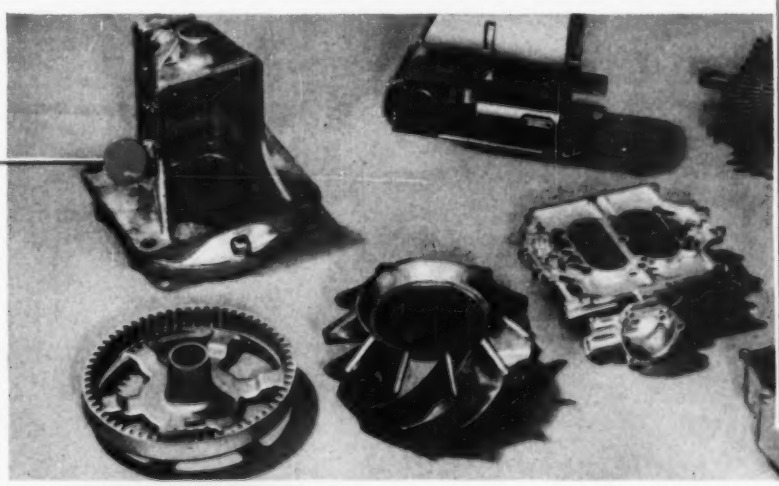
BUNKER HILL 99.99+% ZINC • ST. JOE electrothermic ZINC {High Grade, Intermediate / Brass Special, Prime Western

No Problem's Too Tough *when you call in* ... PRECISION



THIN SECTIONS

Precision's ability to produce die castings with thin sections makes possible castings, where rapid heat transfer, weight reduction or lower metal consumption are desired.



FUNCTIONAL PARTS

Industry is increasingly turning to die cast functional parts. Today modern alloys plus Precision's design and engineering skills combine to produce rigid, strong, accurate functional die cast parts.

Since 1909 the name "PRECISION" has been the symbol of highest quality in the die casting industry.

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Specialists in Zinc Die Casting

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■ *WE FURNISH* zinc die castings of the highest quality delivered in accordance with shipping schedules at prices which are most attractive. For nearly a quarter of a century we have served many of the nation's leading manufacturers in this manner. May we also have the pleasure of serving you?

Exclusively Zinc Die Castings

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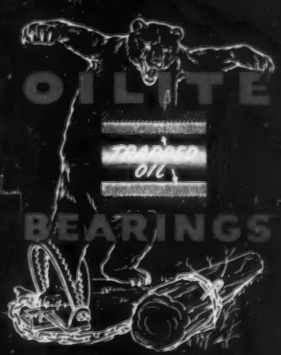

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Oilite Products Include: Bearings, Finished Machine Parts, Cored and Solid Bars, Permanent Filters and Special Units

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THE PLACE: **RANGERS DIE CASTING COMPANY, Lynwood, California**

THE STORY:

Soaked in PYDRAUL . . . Not in Flames

Die-cast products of several kinds are made on the 8 machines in this shop. Two weeks after switching from conventional hydraulic fluid to Monsanto *Pydraul*—and unknown to the operator of a cold-chamber aluminum die-casting machine—an electrical circuit failed.

Operator continued to run the machine until the nitrogen in the accumulator unloaded into the oil reservoir, blowing *Pydraul*, which is fire-resistant, twenty feet into the air—all over the machine, operator, helper, and directly into an open pot of molten aluminum.

THE POINT OF THE STORY:

"Instead of a flash fire and serious burns to several workmen, we suffered only to the extent of two fluid-soaked workers and 40 gallons of *Pydraul*." *Paul T. Harlow, President.*

How safe is the fluid in *your* hydraulic lines today? Without any alterations in equipment, the change-over to *Pydraul* can be made.

PYDRAUL is fire-resistant . . . noncorrosive . . . chemically stable . . . nonreactive . . . nonvolatile—does not evaporate.

SEND for this engineering report. Ask for "Pydraul F-9." Write Monsanto Chemical Company, Organic Chemicals Division, 800 North Twelfth Blvd., St. Louis 1, Missouri.

Pydraul: Reg. U. S. Pat. Off.

MONSANTO
CHEMICALS – PLASTICS
SERVING INDUSTRY... WHICH SERVES MANKIND

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Aircraft engine heat deflector

...ON
THE
FARM

Cream separator bowl base

...stainless castings cut costs

Considerable savings in both material and machining time are effected when Crucible Stainless Steel Sand Castings are used. And here are two good examples.

The heat deflector — which protects vital turbine assembly parts in an advanced model aircraft engine — was cast by Crucible from AMS-5363A (Type 347) stainless . . . in conformance with rigid aircraft quality standards. Previously this part had been completely machined from a solid forging. The cast part performs the same job, but at a substantial saving in manufacturing cost.

The bowl base for a dairy cream separator was cast by Crucible from CF-20 (Type 302) stainless. To permit fast and efficient finishing in automatic machine tools, the casting must be held to close tolerances. Also, it has to be free from porosity, shrinkage, gas holes, inclusions or any defects that in the finished part would interfere with cleanliness or violate food laws.

Both the heat deflector and the bowl base applications exemplify how steel and machining time may be saved by using a stainless steel casting instead of machining from bar stock or a forging. If you make a product that must resist corrosion, consult Crucible regarding the advantages of producing it from a stainless sand casting.

CRUCIBLE first name in special purpose steels

53 years of Fine steelmaking **STAINLESS CASTINGS**

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

STAINLESS • REX HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

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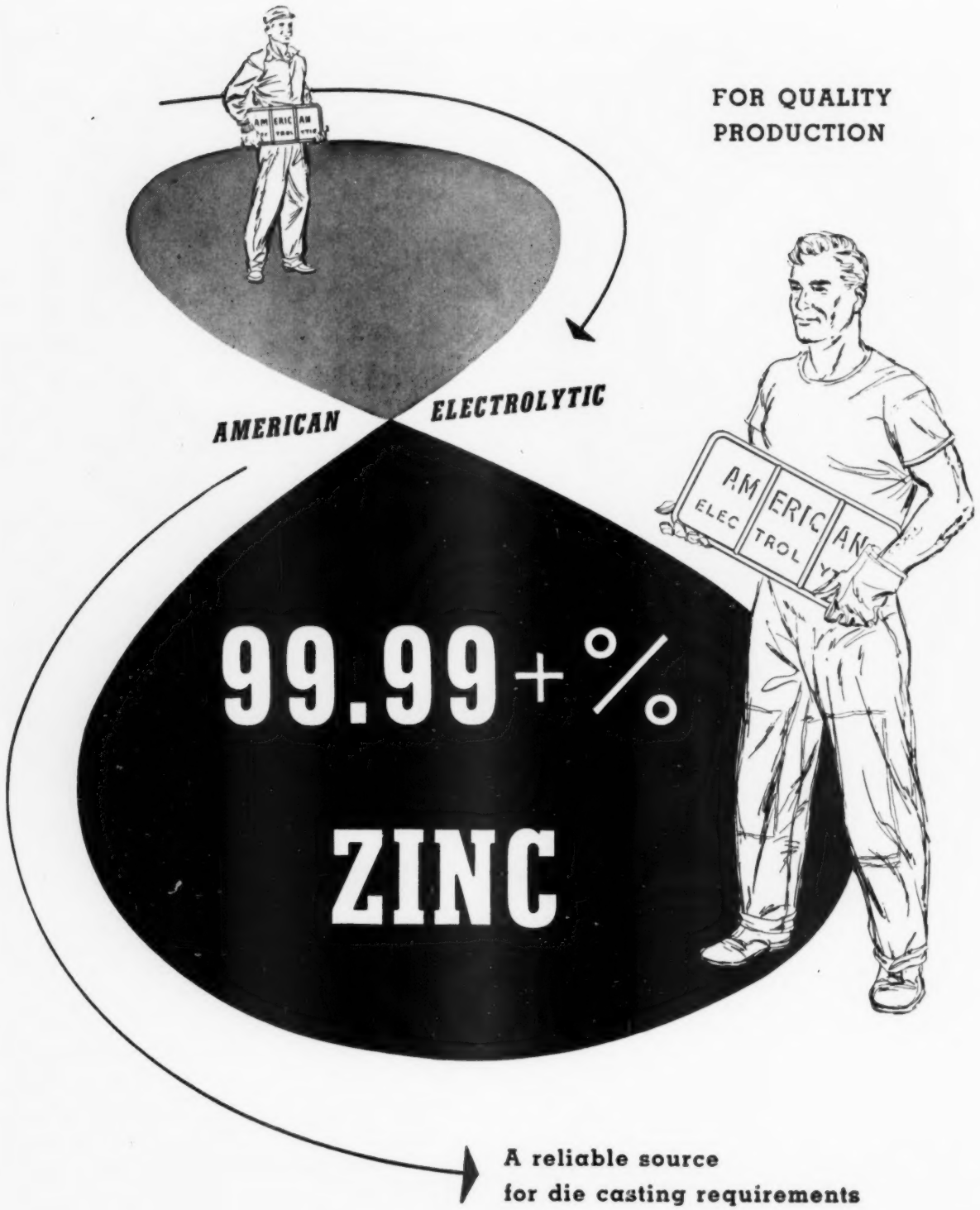

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PARKER *Quality Die Castings*

make
ERIE
Double-Action Hand-Pumps
a **BETTER BUY!**

PULL-PUSH! Only 2 inch piston travel and the new Erie double action piston type hand pump delivers up to 23 gallons per 100 short easy strokes. It's non corrosive inside and out, for the body is aluminum die castings by Parker. Die Castings were selected because machining costs were virtually eliminated . . . and die castings are lightweight and strong. Parker Die Castings are used profitably in nearly every industry. They are produced of exactly the right alloy to rigid specifications. Consult with Parker on your next die casting requirements. Take advantage of Parker's experience in producing highest quality die castings.

and when you think of Die Castings **THINK OF**

PARKER WHITE METAL COMPANY • 2153 McKinley Ave., Erie, Pa.

PARKER **ALUMINUM** *and* **ZINC** *Die Castings*

For additional information Circle No. 26 on the Reader Service Card

Examples of small castings, from a few ounces to 10½ lbs. in aluminum alloy aircraft and ordnance components... larger casting (black background) is a typical example of an Acme casting in aluminum alloy 195-T6, heat treated and aged.

ACME

CASTINGS

ALUMINUM AND MAGNESIUM

Engineered to meet the most exacting requirements

Yes—Acme aluminum and magnesium castings are engineered to meet the most exacting requirements for defense or civilian product applications. Light metal castings from a few ounces to hundreds of pounds are engineered and produced regularly for a growing list of customers.

Whether your present casting requirements are for ten or hundreds of thousands of a single design—we are interested in serving you.

SEND BLUE PRINTS FOR ESTIMATES

Light metal castings, properly engineered and precision made, may give you both a greatly improved product and a saving in manufactured cost.

To get the full benefit of light metals requires expert knowledge from the design stage through the "test casting" stages, and in final production. Acme offers 32 years of engineering and foundry experience.

PHONE
PROSPECT 6-5035

Consulting with Acme engineers may save you many headaches and dollars on production jobs. We welcome your requests for this service.

ACME

ALUMINUM FOUNDRY CO.

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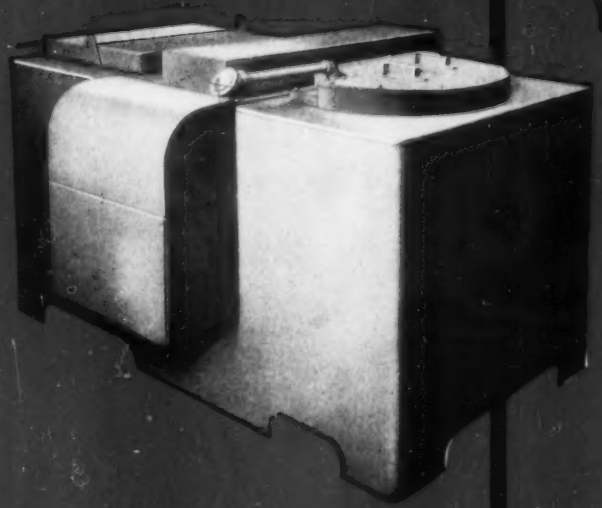
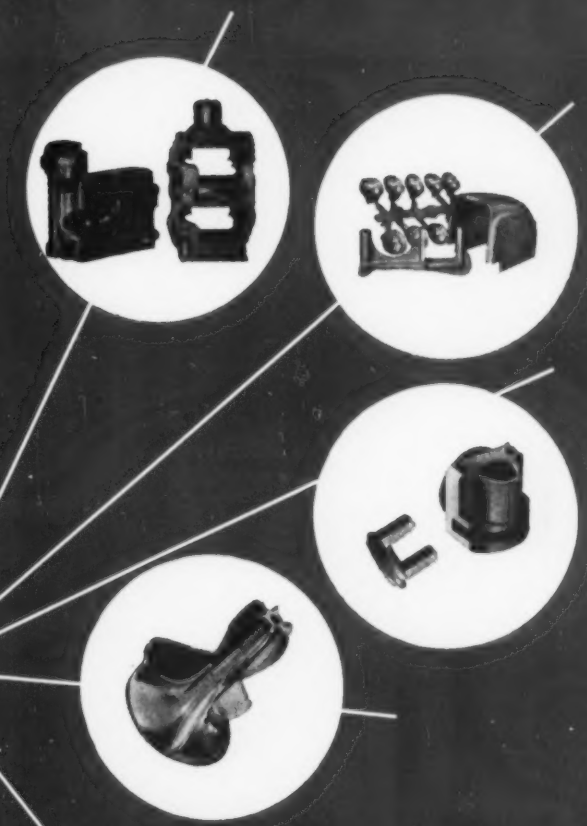
ATTENTION!

Producers of non-ferrous

..die castings
..permanent mold castings
..sand castings
..centrifugal castings



For additional information ask for bulletin 560.



You'll get even better castings if you melt with a

LINDBERG-Fisher
2-CHAMBER MELTING FURNACE

You'll increase production. You'll reduce rejects. You'll improve working conditions. The famous Lindberg-Fisher 2-chamber construction does the trick.

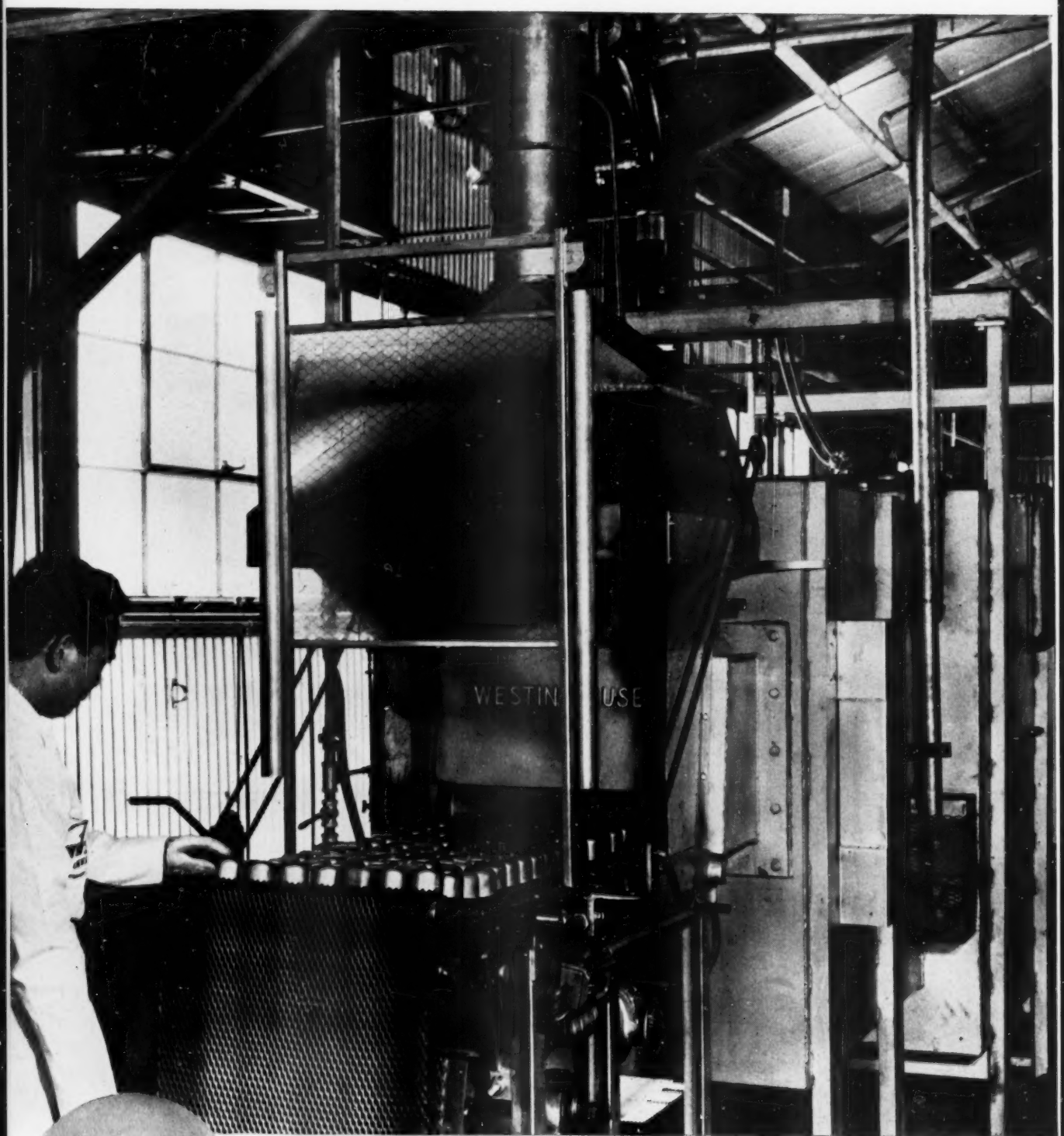
Two-chamber construction gives you cleaner molten metal. Residue and impurities remain in the charging chamber . . and only the clean, residue-free metal passes to the ladling chamber.

Two-chamber construction permits continuous ladling. Cold metal can be added to the charging chamber without affecting temperature of ladling chamber within operating limits of the furnace.

Two-chamber construction permits cooler operation. Induction heating heats only the metal, not the entire furnace. There are no flames—no products of combustion. Only a comparatively small area of molten metal is exposed to operator.

LINDBERG-Fisher MELTING FURNACES

A Division of Lindberg Engineering Company • 2450 West Hubbard Street • Chicago 12, Illinois



IF YOUR PRODUCT CALLS FOR HEAT-TREATING . . . IT CALLS FOR A WESTINGHOUSE FURNACE . . . *GAS OR ELECTRIC.*

"Production capacity increased 400% with Westinghouse Sintering Furnace"

. . . says Kwikset Locks, Inc.

As the largest producer of custom-molded powdered metal parts west of the Mississippi, Kwikset Locks, Inc., of Anaheim, California, has this to say about its Westinghouse Sintering Furnace:

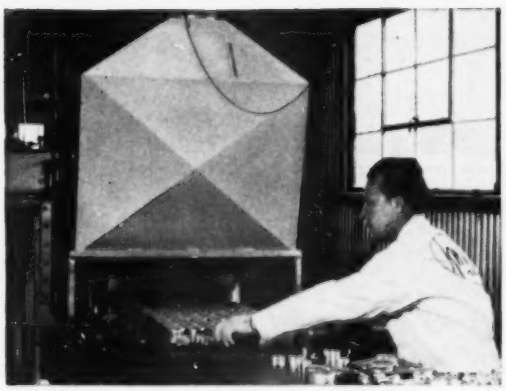
"We chose a Westinghouse Electric Belt Conveyor Furnace when desiring four times the production capacity formerly available. We now enjoy the desired protective atmosphere needed for top-quality control, gain excellent temperature control and response, and take advantage of fast Westinghouse engineering and repair service. We have found, through experience, that Westinghouse Furnaces are easy to operate.

"Our principal operation is sintering brass components for our residential and commercial lock sets. These parts were formerly machined from bar stock, precision cast or stamped. By converting to the sintering process with a Westinghouse Electric Belt Conveyor Furnace, we have eliminated scrap and machine finishing . . . thus increasing production and reducing costs."

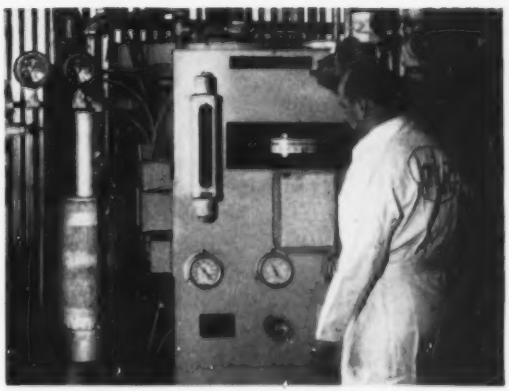
Why not investigate Westinghouse Heat-Treating Furnaces for your plant? A complete line covering every heat-treating job is available. Write for free book *Harnessing Heat* (B-5459). Westinghouse Electric Corporation, Industrial Heating Department, Meadville, Pa. J-10412

YOU CAN BE **SURE**... IF IT'S

Westinghouse



The above shows the "briquettes" after they have left the cooling chamber where they have been cooled below oxidizing temperature. If unusually close tolerances are not involved, the pieces are used as sintered.



Shown above is the Westinghouse Ammogas® Atmosphere Generator (1500 cfh, 1850° F. max.) that gives Kwikset Locks, Inc., the desired atmosphere for top-quality control.

24 HOURS OF "BACK TALK"

...but none about these die-cast parts

CASE HISTORIES FROM MT. VERNON FILES

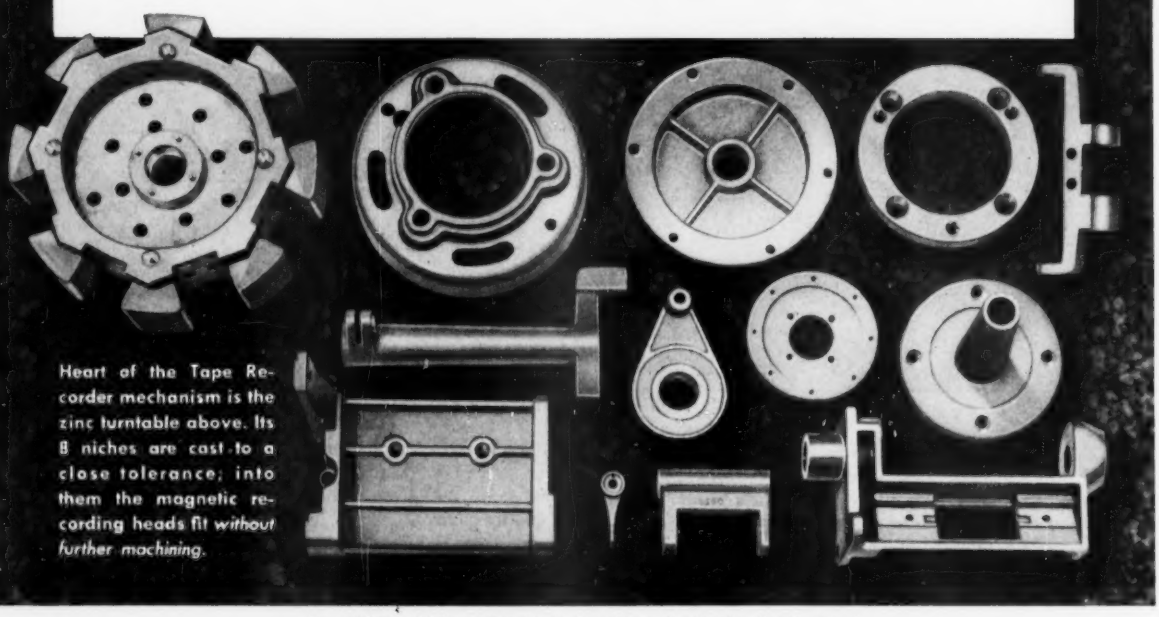
Soundscriber's new 24-hour Magnetic Tape Recorder and Reproducer is the first in its field to provide such a long period of continuous, unattended recording in so small an instrument. It weighs but 80 pounds.

One important reason why this precision instrument is so light, so thoroughly practical, yet so moderate in cost, is the die cast aluminum and zinc parts you see here.

States Soundscriber Corporation: "From long experience with our standard line of dictating equipment, we have found die casting a lower-cost way of making intricate parts. Further, this method allows for more economical use of light-weight metals. Mt. Vernon die casting has always met our high quality standards."

Whatever *your* product, simple or intricate, it will pay you to consult with us. We have up-to-the-minute facilities for precision die casting of aluminum and zinc, and a vast reservoir of experience. It's quite possible that we can show you the way to greatly increased production, lower unit costs —improved products, too.

MT. VERNON
DIE CASTING CORP.
MT VERNON NEW YORK



Heart of the Tape Recorder mechanism is the zinc turntable above. Its 8 niches are cast to a close tolerance; into them the magnetic recording heads fit *without further machining.*

For additional information Circle No. 25 on the Reader Service Card

Manufacturer of steel-cutting shears cuts labor costs 19%—material costs 41% with

Die Castings by Hoover

Right
These castings for a well-known make of steel-cutting shears are notable for their intricate design and precision fit. After absorbing the die costs, the manufacturer expects the direct savings of having these parts die cast by Hoover to return at least 20% a year on his company's investment.

Below
Hoover's facilities include the latest equipment for spectography, fluoroscopy and X-ray to determine the right alloys and casting techniques to eliminate rejects and to assure strength of the finished casting.

HOOVER

Call in a Hoover Engineer to see how Die Castings in aluminum or zinc can help you cut costs and increase production through

- **Reduction in number of parts**
- **Saving in time, labor and material**
- **And improve the appearance and selling appeal of your products.**

Write for this booklet "Die Castings." It will give you a good idea of the outstanding production and research facilities Hoover has available to serve you.

THE HOOVER COMPANY, Die Casting Division, North Canton, Ohio

Get a bid from

HOOVER

Specialists in the fields of die castings since 1922

For additional information Circle No. 15 on the Reader Service Card

Now...

from America's finest precision parts plant you can get Highest-Quality Powder Metal Parts

Your most rigid specifications for top-quality powder metal parts of all alloys can be met fully and promptly by the Metallurgical Products Division of Thompson Products. Our experience in producing millions of parts to commercial and aircraft tolerances enables us to supply accurate, properly engineered parts in large or small quantities at lowest prices compatible with highest quality. This engineering and metallurgical experience can help you redesign to fully utilize the strength and economy of powder.

Your present product . . . or one you plan to make . . . can probably benefit from savings and improvements made possible by using powder-metal parts.

Let us help you take full advantage of a shift to powder metal parts. We'll be glad to advise on engineering and design. To find out more about Thompson's facilities, write for Booklet MP-532.

METALLURGICAL PRODUCTS DIVISION

Thompson Products, Inc.

DEPARTMENT MX-12 • CLEVELAND 17, OHIO

For additional information Circle No. 31 on the Reader Service Card

FROM the Australians, we have adopted a new type of caster which is built of a pair of die castings and two steel shafts.

Free-Rolling Casters Built of Die Castings

are quiet, durable and tough

NEW, quiet, free-swivelling casters of an unusual design have recently been introduced into this country after having been used successfully in Australia for some time.

The Wright-Batchelder Corp. of Boston has brought to this country the patented Shepherd caster which rolls freely over obstructions; does not pick up thread, hair or lint; is permanently lubricated; and glides in any direction without noise.

Here, as in Australia, these spherical casters are built of a pair of die castings, two steel pins 3/8" in diameter, and a steel drive pin that holds the entire assembly together.

Because of their unique features, these casters are finding application in such diverse places as textile mills and beauty parlors where threads or hair tangle the bearings of conventional casters. The round shape of the casters makes them suitable for office equipment and home appliances because they do not mar or scratch.

Pair of die cast hemispheres rotate on two axes

The shell of the Shepherd casters is made up of a pair of hemispheres die cast in either zinc or aluminum. The two halves fit together and rotate on the steel shafts.

The vertical steel pivot shaft rides in a long, cored hole formed in the caster housing, while the horizontal steel axle rides in another hole cored in a boss inside the wheel. These four components are locked firmly together by a drive pin which passes through drilled holes in the caster housing, and engages a groove in the pivot pin and a groove in the wheel boss. By means of the two free-turning shafts, a universal rotation on both axes is obtained.

The choice of zinc or aluminum alloy for the die castings is determined by the use of the casters. If they are to be used on concrete or other rough flooring, a rubber tire is recommended. This is bonded onto the outer surface of the wheel. In this case, aluminum is chosen because of the application of heat and pressure for molding the rubber onto the wheel surface. However, for most uses, the die cast zinc alloy is entirely satisfactory, has good wearing properties, resists impact, and is a dependable bearing material.

continued on page 88

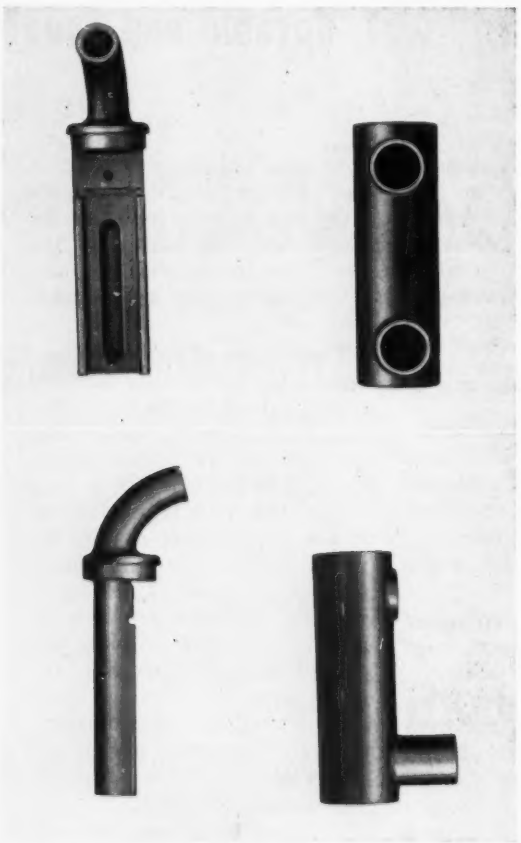
A 10-piece silver soldered assembly has been redesigned. Now . . .

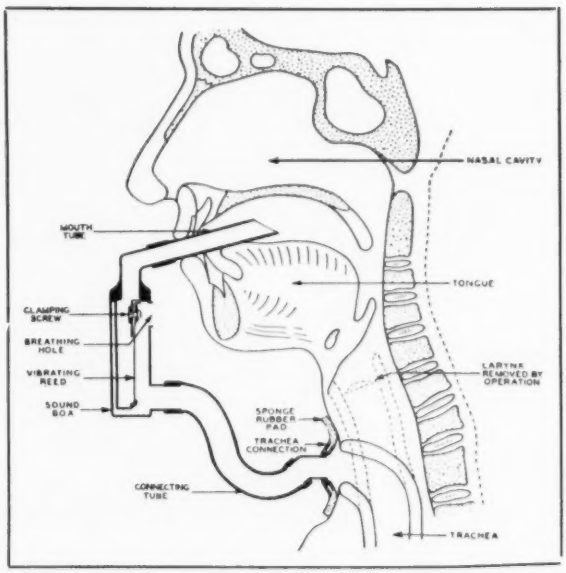
INVESTMENT CAST ARTIFICIAL LARYNX eases fabrication difficulties

By W. B. GIBBS*

1. PROPER OPERATION calls for precision construction of this artificial larynx. When used for speaking, air is inhaled through the hole in the side of the sound box down through the rubber connecting tube and trachea connection to the lungs. Exhaled air then tends pass out the way it entered, but by closing the sound box hole with thumb or finger, the air is forced out around the reed. This causes the reed to vibrate and produce sound which passes out through the stem and rubber tube at the top of the sound box, into the mouth to be converted to speech.

2. TEN SILVER SOLDERED details have been replaced by these two bronze investment castings. The sound box casting, right, and throat casting, left, have simplified assembly.



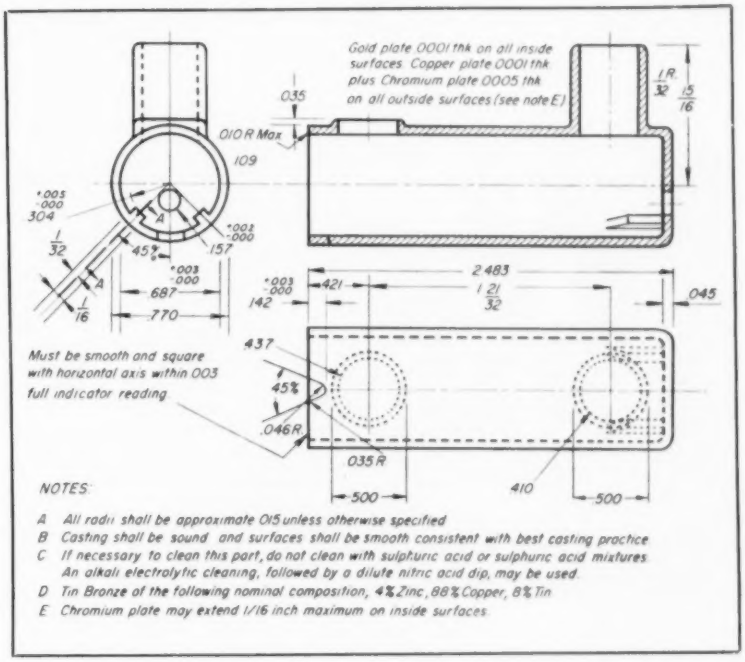


DESPITE its medical orientation, construction of an artificial larynx to restore human voice is basically a problem in metal fabrication. The functional requirements of the apparatus are not easy to fulfill on any sort of production basis.

The Western Electric No. 2 Type artificial larynx is intended to restore the power of speech to a person who has, through an operation, lost the larynx and had the trachea terminated externally in an opening at the base of the neck. It replaces the larynx in that the user breathes through it, thereby originating sound which is projected into the mouth to be modulated into speech.

The manner in which the artificial larynx is constructed is revealed in the functional diagram, Figure 1. It consists essentially of a flexible non-corrosive metal reed which is placed against a rubber cushion inside a gold and chromium plated sound box, a

*Manufacturing Planning Engineer, Western Electric Co., Inc., Burlington, N. C.


Gold plate .0001 thk on all inside surfaces. Copper plate .0001 thk plus Chromium plate .0005 thk on all outside surfaces (see note E)
.035
.010 R Max
.109
1 R.
1/32
15/16
+.005 -.000
.304
+.001 -.000
1/32
45°
.157
+.003 -.000
.687
.770
1/16
+.003 -.000
.142
.421
2.483
1.21 31/32
.045
.437
45°
.046 R
.035 R
Must be smooth and square with horizontal axis within .003 full indicator reading
.500
.410
.500
NOTES:
A All radii shall be approximate .015 unless otherwise specified
B Casting shall be sound and surfaces shall be smooth consistent with best casting practice
C If necessary to clean this part, do not clean with sulphuric acid or sulphuric acid mixtures. An alkali electrolytic cleaning, followed by a dilute nitric acid dip, may be used.
D Tin Bronze of the following nominal composition, 4% Zinc, 88% Copper, 8% Tin
E Chromium plate may extend 1/16 inch maximum on inside surfaces.

3. DETAILS of the investment cast sound box are revealed in this drawing which shows the thin wall section and close dimensional control that are specified.

rubber mouth tube which fits into the metal stem at the top of the sound box, and a flexible rubber connection that fits to the throat connector.

Interior dimensions of the sound box and throat casting, Figure 2, must be held within close tolerances to insure proper operation of the larynx.

Originally the artificial larynx was designated as a fabricated part consisting of about 10 details which were silver soldered together. Several of the details were quite intricate in shape and the application of heat for silver soldering tended to warp the parts out of shape, making it almost impossible to keep the parts within the close tolerances imposed upon the finished product.

The fabricated sound box was made up of three details. The main tubular section had two embossed holes, one for the thumb hole and the other for joining the inlet tube with silver solder. A disc was brazed into position to seal one end of the main section to form the sound box.

The fabricated throat details consisted of a brass tubing bent to an angle of 120° with a turned down section at one end, a machined brass collar, two pins, a .020 thick brass sheet formed as semi-closed channel with a semi-circular disc at each end, a flat plate, and a semi-circular section of .020 thick material. These items were then silver soldered together to form the throat assembly.

The decision to manufacture the artificial larynx using investment castings was a result of the excessive amount of manufacturing difficulties encountered with the fabricated details.

A new design, developed by Bell Telephone Laboratories in conjunction with Arwood Precision Castings Corporation, consists of two investment castings, a thumb screw, a retaining ring and a slug, thus reducing the required assembly details from ten to five. This results in a proportional reduction in assembly operations and consequently in costs.

Few secondary operations other than polishing and plating are required by the investment cast pieces. Assembly now consists of one reaming operation, a grinding operation to maintain a ±.001 dimension, the soldering of a semi-circular disc into one end of the throat casting, and the locking of a thumb screw into position by use of a commercial (Tru-Arc) retaining ring.

Critical interior dimensions are now being held within tolerances indicated on detail drawings, Figure 3.

One determining condition of service which affects the choice of materials is the severe corrosive condition induced by the condensed moisture from the user's respiration. The material must either resist this corrosive action or be capable of being plated for protection.

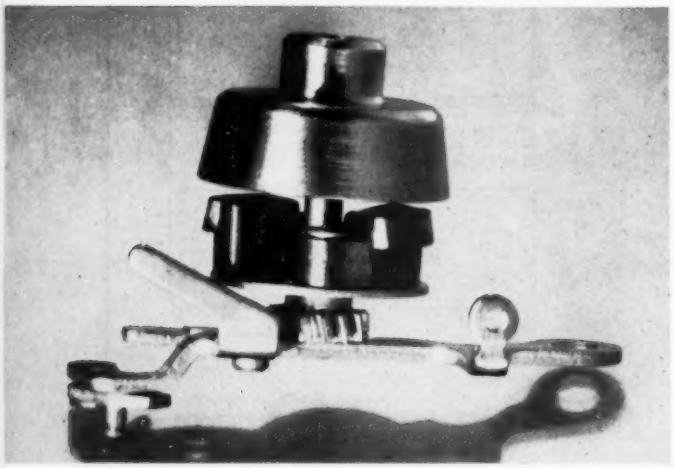
This condition has proved to be the major problem encountered in connection with the

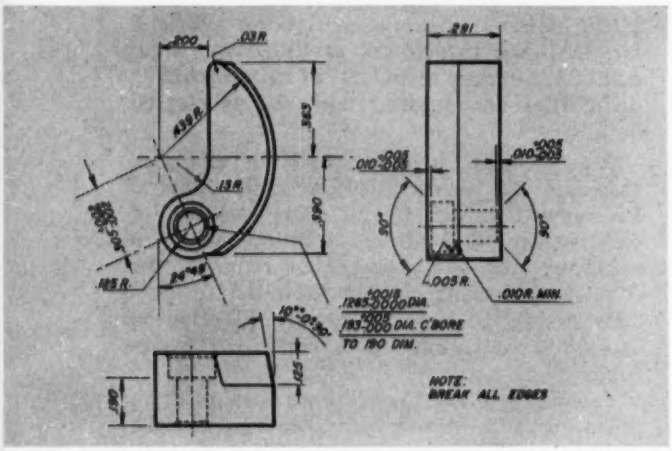
continued on page 75

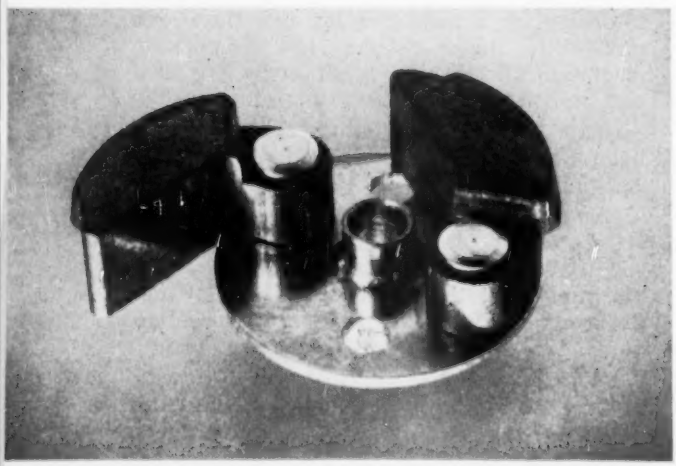
Precise control of speed under all conditions of load is readily done by using metal powder friction materials and governor weights.

SHAPED FRICTION

By W. J. GOVE*







By combining a relatively complicated shape, precise dimensional accuracy, close weight tolerance and controlled friction properties into one part and you have a manufacturing problem that will give any production man a headache — any production man, that is, except a powder metallurgist.

Just this unique combination of requirements were combined in the design of the small iron weights for the governor brake on an electric typewriter manufactured by the Underwood Corp., of Hartford Conn. A few of the weights were "whittled-out" of wrought stock for testing purposes and then the production problem turned over to the Keystone Carbon Co. for pro-

1. AS THE SPEED of carriage traverse increases, the weights fly out and press against the tapered cup. The vertical position of the cup determines the speed.

2. THIS INTRICATE PART would be expensive to machine, but is easily made from iron powder. Controlled friction properties are an added advantage gained through the use of a powder metal part.

3. BY MOUNTING the fly weights as shown the center of mass shifts as the effective radius changes with changing speed. Thus at higher speeds the braking pressure against the wall of the stationary cup is increased.

MEMBERS control movement in rapid action mechanisms

duction as an iron powdered part.

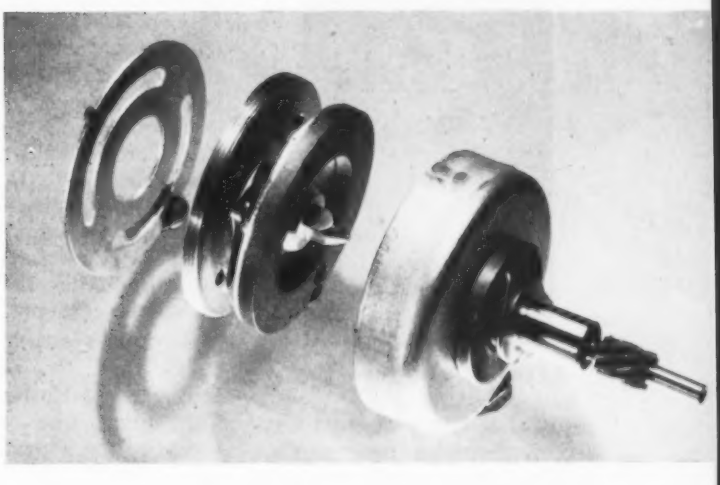
When the tabulator key of a typewriter is depressed the carriage must move rapidly, but at a uniform rate. The vagaries of the human operator are such that the rate of movement must be variable within rather wide limits.

To control the rate of traverse a governor-brake shown in Figure 1 was designed. In operation this device is essentially a fly-ball type of governor which utilizes the friction of the weights against a tapered cup for speed control instead of actuation of some sort of valving device.

As the tapered cup is raised when the speed of rotation of the base plate is increased, the weights can swing farther out. When these weights contact the inner surface of the cup, friction between them and the cup acts as an effective brake. With increased speed, the braking action must be greater and hence the weights are designed and mounted so that there is a shift in the center of mass sufficient to achieve the necessary control.

From the brief description of the operation it becomes apparent why close tolerances on weight, dimensions and frictional properties are important. Contact area of both weights against the cup must be the same and contact pressure of both weights must be as nearly identical as possible.

*Chief Product Engineer, Underwood Corp., Hartford, Conn.



4. THE CONTROLLED FRICTION properties of powdered bronze make possible this small slip clutch used for over-load protection on electric typewriters.

Even with both of these factors under close control the frictional characteristics must be constant so that all parts are interchangeable and so that brakes made from different batches of parts will have the same operational features.

The design of the weights and the method of mounting them on a rotating plate is shown more clearly in Figures 2 and 3. Consistent with good design practice dimensional tolerances are as open as possible, but for this application most dimensions must be held closer than average shop practice.

Disregarding, for the moment, the need for controlled frictional properties, if one were to consider other possible methods of fabrication only two seem feasible. The pieces could be cast and machined all over or they could be machined from wrought bar or plate stock. In either case contour milling would have to be done to secure the same shape and, on the scale of manufacture of these parts, this method would be highly uneconomical.

Some other precision casting methods might be employed,

continued on page 90

Need to Educate Designers and Consumers Concerning Magnesium Indicated by Howard

IF THE MARKET FOR MAGNESIUM is to continue to expand in the future, as it has previously under the impetus of military aircraft buying, widespread new civilian uses will have to be stimulated This theme was heard from many speakers during the ninth annual meeting of The Magnesium Association held in New York during early October.

Keynoter

Frank C. Howard, Sr.

About 450 attended the two-day sessions, heard technical reports, and discussed the state of magnesium production and sales.

New officers were elected for the 1954 term. J. S. Kirkpatrick, vice president of Brooks & Perkins, Inc., Detroit, was named president of the organization; L. G. White, general manager and director of Dominion Magnesium Limited, Toronto, was elected vice president; J. V. Cosman, president and general manager of Superior Bearing Bronze Co., Brooklyn, was elected treasurer; and Miss M. I. Hansen, assistant secretary.

Keynote speaker was Frank C. Howard, Sr., chairman of the board of Howard Foundry Company, who emphasized the need for education at both the design and consumer levels. Excerpts from Mr. Howard's address are printed here . . .

" . . . Magnesium is no stranger. Since its first isolation in 1928, its major growth has been dependent on two world wars, and, in between, research by private interests. We all know, for example, that during World War II, our small annual production reached about 200,000 tons, a figure that tends to mellow every one of us at the thought.

"Today, our foundry alone is geared to handle six million pounds annually.

"These figures are enough to cheer the cockles of my heart, but they mean nothing in the immediate years ahead. You can't live off past receipts. And I do not visualize a rosy future for our industry unless we can transfer our wealth of knowledge about our industry to more design engineers, manufacturers and ultimately the public.

"Now, I can hear you mutter: "There's hardly a scratch of commercial work in the country for magnesium sand castings." And confidentially you're right. The way we're handling magnesium today,

continued on page 86

MAGNESIUM ASSOCIATION ELECTS NEW OFFICERS

President

J. S. Kirkpatrick

Vice President

L. G. White

Treasurer

J. V. Cosman

MAGNESIUM SHIPMENTS IN TONS

Year	Sand Castings	Die Castings	Permanent Mold (1) Castings	Sheet	Extrusions	Forgings (2)
1952	11,929*	4,500*	1,000*	3,500*	5,433*	200*
1951	11,413*	3,500*	500*	3,800*	5,245*	500*
1950	6,790*	573*	250*	2,632*	3,670*	104*
1949	4,808*	468*	250*	1,537*	2,395*	200*
1948	3,917*	413*	350*	914*	1,916*	103*
1947	3,202	280	365	938	1,462	105
1946	3,575	396	266	1,706	1,616	99
1945	21,236	845	3,445	1,450	1,559	152
1944	37,610	1,181	3,198	1,154	4,867	344
1943	29,561	1,432	1,989	840	516	113
1942	16,146	653	606	438	238	22

Source: 1928-1944, U. S. Bureau of Mines 1945-1952, Department of Commerce, Facts for Industry.
(1) Excluding incendiary bomb castings.
(2) 1944 all Magnesium Products and 1945-1950 Forgings are ingot equivalent.
*Estimated division of Facts for Industry total.
Revised: Sept. 21, 1953

Die Castings — fastest growing use of magnesium

SINCE 1947, the use of magnesium die castings has multiplied 16-fold to become the fastest growing fabricating method for this light-weight metal. Or expressed another way, die casting has jumped from one of the smallest consumers of mag, until now it rates a strong third from the top. On the following pages are presented some facts to show why this is happening . . .

PRODUCTION OF primary magnesium ingot during 1952 was 105,821 tons. This was 2½ times the 1951 production. Six government-owned plants started operations between April and November 1951, so 1952 represented their first full year and they produced 76% of the total output.

During 1952 the private and Government electrolytic plants operated at 100% of rated capacity. The government silicothermic plant produced at 55% of their rated capacity partially because of the electric power shortage in the Northwest. These four silicothermic plants and one government electrolytic plant are said to be uneconomic and for this reason were shut down in June.

The price of primary magnesium ingot in 1952 was $0.245 per pound f. o. b. shipping point. On March 9, 1953 this price was increased to $0.27. The consumption of primary magnesium during 1952 was 43,847 tons. This was 23% over 1951 but, since the production increased much more, sufficient metal became available to meet the demand and at the same time make substantial additions to the stockpile. Consumption data for purchased scrap and secondary magnesium show 10,008 tons for 1952.

Since 1947 the production of semi-fabricated products, such as castings and wrought products, has increased nearly 300%. Currently, there are approximately the following number of producers: 81 sand and permanent mold foundries, 34 die casters, 4 extruders, 6 rolling mills, and 4 forging shops.

MAGNESIUM DIE CASTINGS

By G. F. HODGSON*

MAGNESIUM has moved into an important position in the die casting industry during the past few years. While die casting as a whole has increased steadily since 1945, the relative percentage increase of magnesium in the past few years has been even greater.

At no time since commercial production was started in the early thirties, has activity been at so high a level. Magnesium has reached into practically every market known to the die casting industry and can be found today in such items as typewriters, washing machines, food mixers, cameras, and automobiles which have used zinc and aluminum for years.

Today magnesium is specified as an acceptable alternate material in an increasing number of commercial applications. Here we would like to differentiate between a **substitute** material, which implies a temporary change, and an **alternate** material, which denotes acceptance on equal status.

Two factors have been most influential in this swing to magnesium. The first is price. In the past, magnesium die castings have been overshadowed by aluminum. In part this was due to greater knowledge and experience with aluminum. But this was also coupled with a generally more favorable price situation.

Between 1945 and 1950 magnesium had come close to being competitive with aluminum at several periods, but the advantage has almost always been in favor of aluminum.

Late in 1950, a sharp increase in the price of secondary aluminum tipped the balance in favor of magnesium and started the present activity.

The second factor, which followed close behind the price change and which contributed heavily to the present situation, was the restrictions imposed on aluminum for commercial use due to the Korean war priorities.

Because of these restric-

DIE CASTINGS=BIG VOLUME

Acceptance by the mass production industries caused the enormous growth of uses for zinc and aluminum die castings. Here is evidence that magnesium has joined the parade. Five of the mass production industries now making good use of magnesium die castings are . . . . .

AUTOMOTIVE Few industries are more cost conscious than the builders of automobiles. Here are some die cast magnesium parts that have been specified strictly on a cost basis.

tions, demand for magnesium increased rapidly and for a short time existing ingot facilities were taxed to the limit. Fortunately, it took less than a year to reactivate stand-by plants to relieve this temporary shortage.

The production of magnesium die castings in 1952 was more than ten times that of 1946, 1947, or 1948. *(See page 39 — Ed.)*

Magnesium is normally noted for its light weight and good machinability. To these well-known properties two new ones had thus been added, price and availability. Magnesium had become cheaper than secondary aluminum; and it was abundant enough so that its commercial use was not restricted.

As a result of the increased activity, service experience in many favorable applications has been greatly broadened. To the regular die casting applications, have been added many more which would not normally have swung to magnesium except for the change in price and availability. Some of these applications and service experiences will be reviewed later.

*Doehler-Jarvis Div., National Lead Co.

How was such a sharp increase in production achieved? Mainly through conversion of existing aluminum dies to run magnesium.

Of the 622 plants engaged in die casting in the United States today, it is estimated that about 12, at the most, are running magnesium. Six plants accounted for over 80 percent of the tonnage reported in 1952. The consumption of magnesium during this period might have been far greater, if more die-casting plants had previous experience in casting magnesium.

This paper, presented at the ninth annual meeting of The Magnesium Association, is so interesting that the editors of PMM present it here in full.

Since it is practically the same as for aluminum, the casting equipment was available. Conventional cold chamber machines are used almost exclusively for both aluminum and magnesium. Unfortunately for the magnesium industry however, a real shortage existed in casting experience.

Dies

Because dies for both metals are almost identical in construction, conversion can usually be accomplished with only minor changes, such as gating.

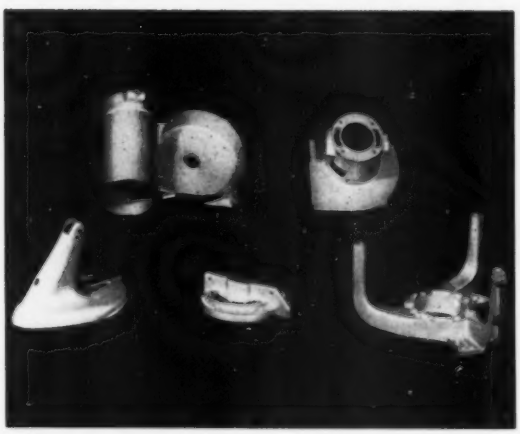
But dies constructed for zinc are seldom satisfactorily converted to magnesium. This is because of the difference in the shrinkage and casting properties of the two metals and the light construction of zinc dies, which generally operate on the lower-pressure plunger-type machines.

Metal handling

The main difference between die casting of aluminum and magnesium is in the handling of the metal. The die casting process requires a continuous supply of molten metal to keep the machines in operation. In the case of aluminum, the molten metal is prepared in large reverberatory furnaces with a capacity of 10,000 pounds or more.

Preparation of magnesium

continued next page



HOME APPLIANCE Finishability and light weight are both useful properties in components of household appliances. Magnesium die castings now in use include these.

BUSINESS MACHINE Many years experience has already been gained by builders of business machines who are using magnesium die castings for structural and functional parts.

MORE USES →

for casting is done on a much smaller scale. Tilting furnaces containing heavy cast steel pots of about 300 pound capacity are used for melting. The standard No. 230 flux is used for protection and refining. In some cases the No. 310 flux is needed to separate decomposition products of some of the die castings from the metal.

Transportation of molten metal from the melting department to the casting department is considered desirable for the maintenance of consistent casting temperatures. Transfer ladles carried on lift-trucks are used. The holding furnace, which is located at the machine near the operator, also contains a heavy cast steel pot.

Protection of the molten magnesium alloy from oxidation during the casting operation is accomplished with sulphur dioxide. This can either be generated in a dome or introduced from a cylinder containing the compressed gas.

The sulphur dome, consists of a hollow cast iron cap, containing a port at the top for introducing crystalline sulphur, an opening in the side to accommodate the ladle, an air line to introduce air for combustion with the molten sulphur, and escape openings to allow the generated sulphur dioxide to be directed onto the metal. Consumption of sulphur is about one-half pound per hour, using air at one pound pressure. Some sublimed sulphur is carried over, which forms a film on the metal surface; this is believed to be responsible for slightly better protection by the generated sulphur dioxide gas than by the cylinder gas.

Efficient operation of the sulphur dome is the key to successful magnesium die-casting. It is the only means of protection available to provide clean metal. Drafts which affect the blanket of sulphur dioxide gas over the metal should be avoided.

Cleaning of the metal in the holding pot is necessary once per shift and a special flux is used for this purpose. This is essentially a magnesium chloride flux with density adjusted to allow quick and complete separation from the melt on completion of the fluxing operation.

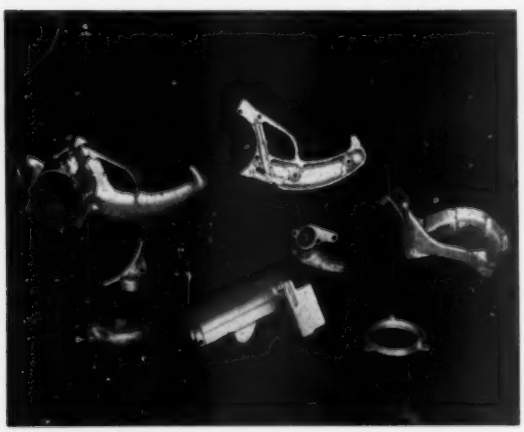
Casting

The actual casting operation is carried out in a manner identical to that of aluminum. Here some advantages of magnesium are evident which can result in better performance. The heat content of magnesium at the casting temperature is considerably below that of aluminum; as a result, dies run as much as 30 percent faster in magnesium. Less lubrication of die surfaces is required. This in turn helps to increase the internal soundness of the castings by eliminating most of the objectionable oil vapor during the casting cycle.

Unlike aluminum, magnesium does not solder to die surfaces or cores. It also has less tendency to gall or rub on ejection. Holes can be cast with less taper, and there are cases on record where parts with intricate coring are successfully made in magnesium where they could not be made in aluminum.

An example of this is the angle block for a printer's chase. This part, which is only 5 inches square contains

MORE USES →



PORTABLE TOOLS Light weight is the primary requirement of portable tools. Produced in large volume, these products represent an important use for magnesium die castings.

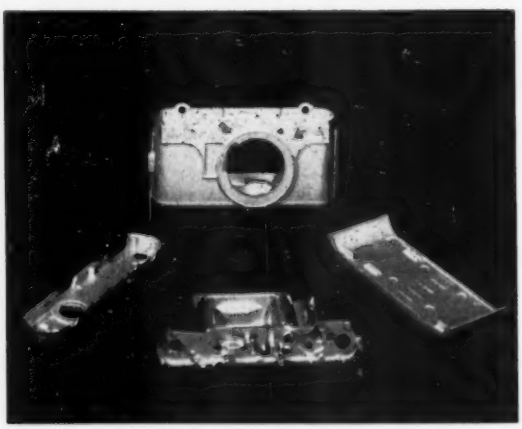


PHOTO EQUIPMENT Both consumers and military, alike, have found that magnesium die castings make good housings and working parts in cameras and photo-optical goods.

131 cores 3/8 inches diameter in each half of the die, so that the casting is a veritable honeycomb of holes. Each core has a maximum taper of .001 and the hole sizes are held to ± .001. A control dimension, 2½ inches long, in this casting is held to ± .002. Such tolerances are not possible in aluminum, and are not common in zinc.

Expansion of cleaning* facilities is somewhat more involved, because of the special grinding equipment required for magnesium. Castings are usually furnished by the die caster with the chrome-pickle finish which is frequently used as the base for subsequent paint coatings.

Applications

The outstanding basic advantage of magnesium is its lightness. It is ideally suited for portable equipment. The optical industry was quick to take advantage of the die casting process for providing light weight in opera glasses and binoculars. Magnesium bodies and eyepiece frames of such glasses, as well as bodies, caps, prism shelves of binoculars, have been in continuous service for more than fifteen years and are accepted as standard materials.

Binocular body castings are rather intricate and generally require the use of loose die inserts to form recesses for prisms. Walls must be as thin as possible to maintain light weight, and dimensional stability is required for perfect alignment of the optics. Corrosion resistance is also a requirement. This is met by following a rigid paint schedule, using Dow No. 7 chemical treatment, with a baked primer and two coats of baked enamel.

Camera cases for still cameras are being produced in magnesium, with one popular model having been in production for seven years. More than 200,000 of these cases are in service with satisfactory performance.

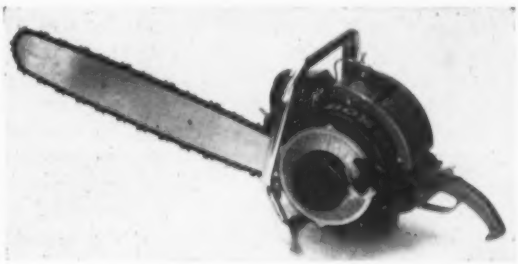
Castings for cameras require very close tolerances, and sections with wall thicknesses as low as .060 are common. Light seals on cases and covers are required to have as little draft as possible and must have sharp detail. Finish requirements are strict wherever surfaces are visible on the finished camera.

One leading manufacturer of press cameras reports that it has been using magnesium die castings for the red blocks, optical view finders, focusing panels and backs for some six or seven years on two of their models. It has had no complaints which could be attributable to the metal, nor are there any records to date of deterioration of any of these parts in service. The castings used on these cameras are treated with the Dow No. 1 chrome-pickle, baked zinc chromate primer, followed by a black wrinkle finish on the outer surfaces. Inner surfaces are left with the single coat of black zinc chromate primer.

Home movie camera cases are now on test, using organic finishes to replace the traditional polished aluminum. Experimental models electroplated with copper, nickel, and chromium are under test but none is in commercial production. Electroplated finishes, if successful, are likely to be adopted for the more expensive cameras.

The U. S. Army Signal Corps has selected magnesium for the new 70mm Combat Camera, which can take pictures as fast as the operator can click them off. It is described as being unharmed by dust, light, fungus, moisture, or driving rain. Four magnesium die castings form the case and internal parts of the "Dream Camera", which will eventually be available in a civilian model.

In the projector field, magnesium has been in continuous use for parts of one model approximately ten years, with its use gradually spreading to other models. Satisfactory applications are for bases, reel arms, mechanism housings, and lamp house covers. The use of magnesium die castings in this field has been mainly for parts of 16mm sound projectors where the weight saving is more of an advantage.



UNUSUALLY ROUGH service conditions are met by the magnesium die castings used in power-driven portable tools, such as this new chain saw.

An interesting new use for magnesium die casting has developed over the past few years in the power chain-saw field. The first light weight models, introduced about eight years ago, received wide acceptance. As newer models are introduced, it is apparent that the trend toward magnesium die castings, for all possible components, is almost universal. Light weight is the primary requirement; but all parts must be rugged to withstand the rough handling of normal service. Magnesium die castings have given an excellent account of themselves in this service.

continued on page 91

*The term "cleaning" refers to trimming, filing, and light machining performed on die castings to prepare them for shipment.

A manufacturer of shot guns finds a way to get

Good Performance at Lower Cost

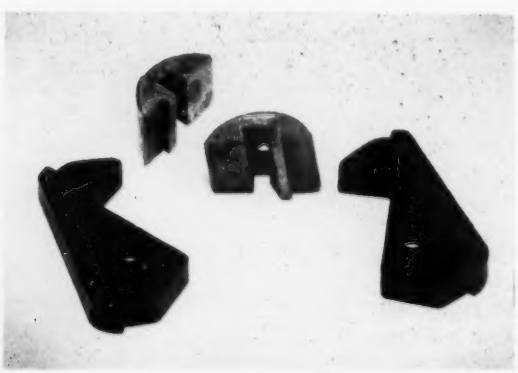
Powder Metal Parts

THE growing importance of iron powder parts in fields where wear resistance and interchangeability of parts are needed is well illustrated in the use made by Harrington & Richardson, Inc. in some of their guns.

Both the sear and the bolt guide and ejector were formerly machined from wrought stock, hardened after machining. The sear has no particular impact loading, but must have good wear resistance qualities and have relatively high strength. Through the use of iron powder part the piece is now made at lower cost and with far greater uniformity than was possible before.

The bolt guide and ejector must have good wear resistance and strength characteristics and must also be able to stand reasonable impact loading. A further requirement is that the sharp corner (indicated by the arrow) must remain sharp at all times.

Both parts are infiltrated with copper, then case carburized to a depth of 0.015 to 0.020 inches and hardened. Generally no machine work at all is required after carburizing and hardening since the fabrication holds dimensions to ± 0.0015. Present costs are about one-third the former manufacturing cost.



Die Castings

THE TRIGGER GUARD of a shot gun is not a place to use a metal of low impact strength. Neither is it a place to use a brittle material. For these reasons tradition has dictated that trigger guards be made of malleable iron or some similar metal; a cast guard required machining all over followed by plating or blueing to insure against corrosion.

Changing this part to a zinc die casting, therefore, represents a startling departure from well established custom. The zinc die casting, however, does everything than can reasonably be expected of it. Normal accidental dropping of the gun or striking it on hard objects in the field will not break the guard. In fact, in the opinion of experts of Harrington-Richardson, Inc., any blow that severely damages a die cast trigger guard would also damage a malleable iron one severely enough to require replacement.

Except for drilling three holes the die cast part requires no finish machining. Finishing is by chromium plating as before, but the cost of surface preparation is much lower for the die casting than for a machined iron part. The conversion to a die cast trigger guard shows a 75 percent cost reduction.

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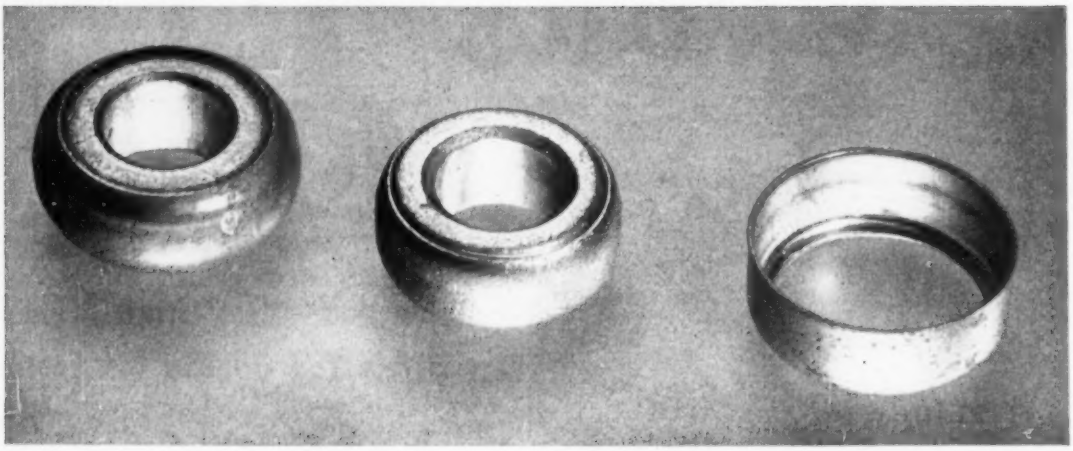

A CUP formed of .015 sheet stock is placed over the powdered bronze bushing and spun to form a tight shroud.

SHROUDED BUSHINGS solve problem of appearance and lubrication

By L. R. DICKINSON*

ONE of the problems that has retarded the use of metal powder parts in certain applications is the inability to secure a good plated surface. In some cases it is possible to impregnate with one of the proprietary compounds available and then electroplate over the sealed surface. This will work if the individual pores are not too large in which case a discontinuity in the plated surface is bound to appear.

Another method of overcoming the trouble is to use a high density part so that any porosity is very small and the pores are not interconnected.

*Design Engineer, McKinney Mfg. Co., Pittsburgh, Pa.

Surface burnishing, peening, and many other methods have been used and each one is applicable in a limited number of cases.

When one starts, however, with a porous bushing that must, in use, be impregnated with oil, then none of these schemes can be used. Such a case is found in the bronze bushings used on the hinges made by the McKinney Mfg. Co. of Pittsburgh, Pa. These bushings, made by the Amplex Mfg. Div., of Chrysler Corp. are used in six different sizes on the higher priced heavy duty door hinges. Since the first and most obvious function of the hinge bushing is to act as a permanently lubricated element, all subsequent operations must be such that they will not disturb this function.

The hinges are made in a wide variety of metals and finishes and the bushings, where they are exposed to view must match the finish of the hinge. Since all of the bearings are bronze a method had to be found to plate the outside surface without destroying the functional characteristics.

The solution now being used is to shroud the bearing with a drawn brass cup. The piece was so designed (see illustration) that a small shoulder was left on top and bottom. A cup is made of 0.015 thick stock and when placed on the bushing and spun down forms

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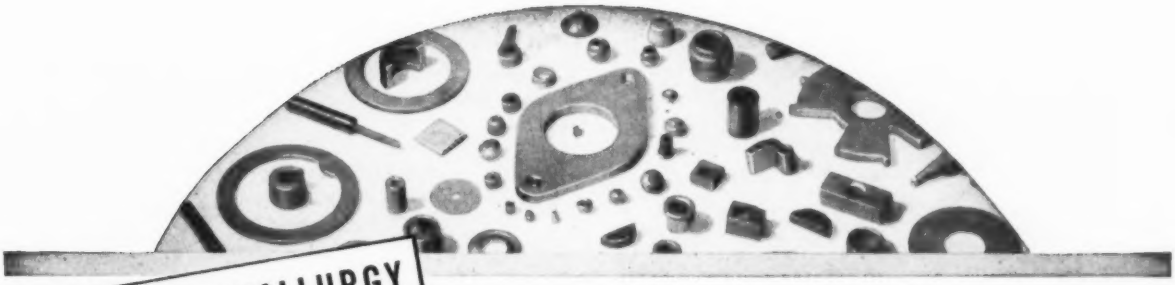

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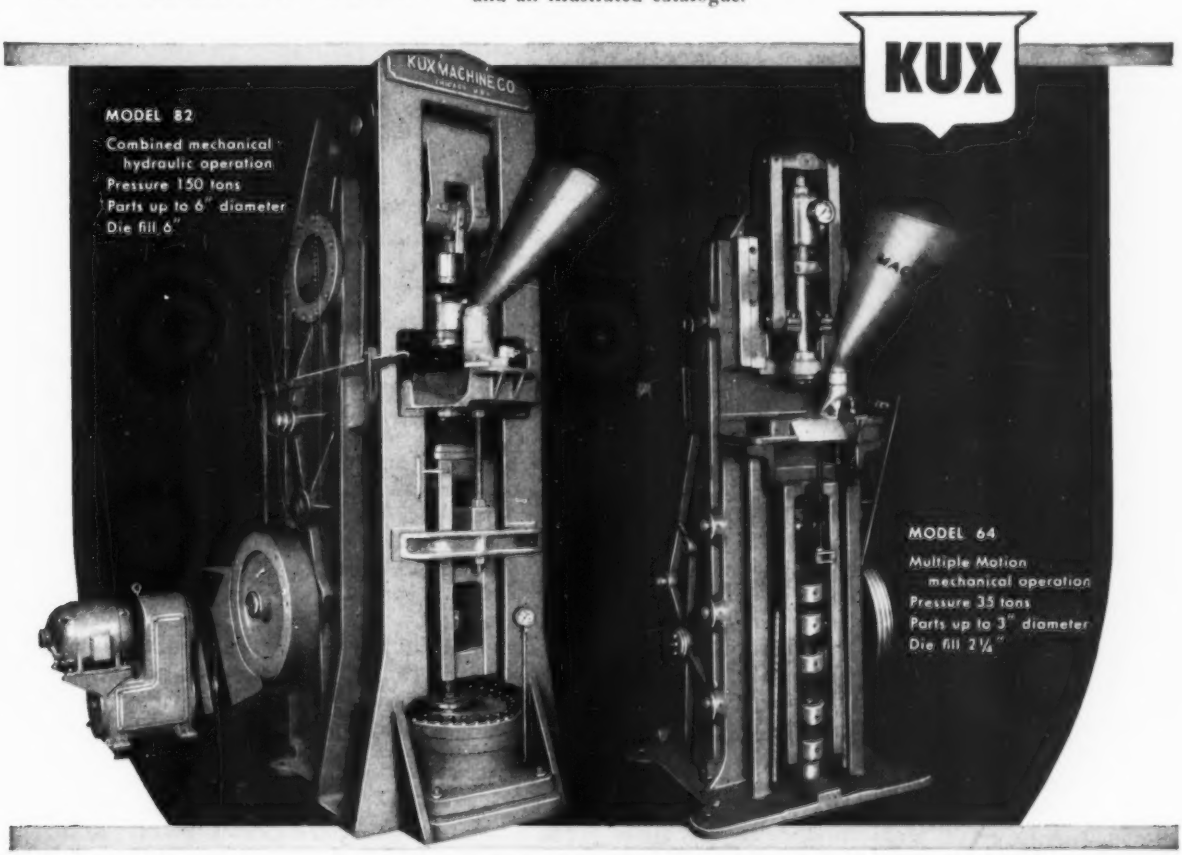

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THE POWDER-ACTUATED Ramset fastening tool is shown here in two views, assembled and disassembled. Position of the three investment cast parts can be seen, below.

THREE-WAY SAVING: Tooling, Piece Costs, Finishing

By R. J. KOPF*

INVESTMENT casting is one of the exceptions to the generalization that mass production methods are almost always associated with high initial tooling costs. In case-after-case, it has been shown that through the use of investment casting as a manufacturing method both piece costs and initial tooling costs are reduced. Further, except in unusual cases there is practically no direct tool maintenance to be considered.

How favorably investment casting can work for the small manufacturer is shown in the experience of Ramset Fasteners, Inc. Cleveland, Ohio., a division of Olin Industries, who use three of these castings in one of their powder actuated fastening tools, the Ramset Jobmaster.

The trigger, is cast in tool steel[1] by the Midwest Precision Casting Co. The piece, as delivered by the foundry is finished except for drilling the one hole shown.

Location of the hole is critical and must be held to a positional variance of less than 0.004. The investment cast trigger is made with sufficient accuracy that the sear can be used as a locating point in a relatively simple and inexpensive drill jig.

[1]Composition of steel:

C	.47 - .53		V	.15 - .25	
Cr	1.10 - 1.30		Mn	.15 - .25	
W	2.25 - 2.75		Si	.65 - .85	

After drilling, the trigger is hardened to 50 Rockwell C, sand-blasted, and then given a Dulite finish to produce an attractive black.

Compare this simple manufacture with the next best method. Here would be involved blanking, shaving, milling radius on finger bearing, drill, heat treat, sand-blast and surface finish. True, only three extra operations are involved, but look at the cost differential.

First consider tooling; dies for blanking and shaving alone were quoted at $1700 and the special tooling for milling at $200. A total tooling cost of $1900 as contrasted with $500 for investment casting tooling. And that isn't all.

Blanking and shaving dies require a very considerable amount of maintenance as do milling cutters whereas the investment casting tooling, barring accidents, requires practically none.

Furthermore, as blanked and shaved, the sear is not sufficiently accurate to be used as a locating point, necessitating the use of a more complex and more expensive drill jig.

So we see that there is a very large initial saving. Now how about the per piece prices. The only costs available are for drilling and

*Chief Engineer, Ramset Fasteners, Inc., Cleveland, Ohio.

blanking where the best bid was over $1.00 per piece. To this must be added milling costs. The investment casting, on the other hand delivers ready for drilling for less than 50c so that the piece saving when the trigger is ready for drilling is well over 50c and probably closer to $1.00.

The two other investment castings used by Ramset Fasteners, Inc., are made by International Nickel Co. in 1020 steel. A similar analysis of cost savings can be made for both.

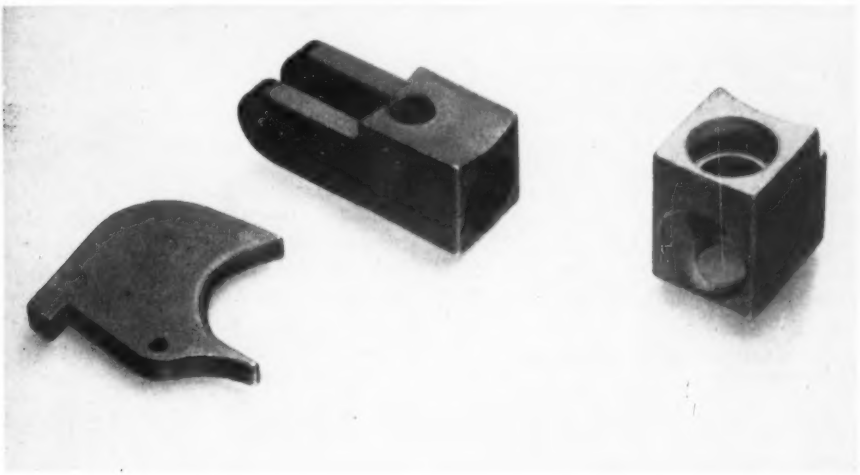
The hinge bracket, requires two simple machining operations prior to Dulite finishing. To machine the piece from bar stock would require 12 operations and eight different set-ups; several of the machine operations would be on milling machines.

Tooling costs for investment casting were $735 as compared with estimated tooling costs for machining from bar stock of about $1000. The per piece price of the investment casting is less than half the cost of a fully machined piece when both are ready for hardening and surface finishing.

The safety release bracket. shows much the same comparison. Tooling costs for machining from bar stock were quoted at $500 as against investment casting tooling of $405. To fully machine would have required eight operations and four set-ups, plus hardening and surface finishing. The investment casting is ready for hardening and finishing as received. Costs in this case are, again, about one-half for the investment casting.

A comparison of some of the difference in methods of manufacture on these three pieces is given in the table below.

Here's how they compare



	TRIGGER	HINGE BRACKET	SAFETY RELEASE
COSTS			
Inv. casting tooling	$ 500.00	$ 735.00	$405.00
Machining tooling	1700.00	1000.00	500.00
Piece cost of inv. casting as percent of cost of machined part	under 50	under 50	under 50
OPERATIONS			
Inv. casting machining	Drill	Drill, tap, ream	none
Other method machining	Blank, shave, mill, drill	12 operations 8 set-ups	8 operations 4 set-ups
Common operations	Sand blast, harden, finish	Harden, finish	Harden, finish

When Machine Shop Methods Were Too Costly...

By I. S. STAPSY*

THE filter mount for an aerial camera manufactured by Buhl Optical Co. of Pittsburgh, Pa. relies on a bayonet type fastener to hold it in position. Since a dropped filter, under usual operating conditions, is difficult to recover, some means must be found to prevent loosening of the mount. A small latch has been designed to do this job.

Examination of the latch shown at the left would seem to indicate that the latch could best be made by machining from bar stock. However, the contour of the nose of the lock is designed so that the thumb piece need not be depressed when the filter mount is put on. This necessitates a milling operation of some difficulty.

Under the thumb piece there must also be provided some type of retainers to hold the compression spring. These may be either pins onto which the spring is set, or recesses into which the spring fits. In either case, providing these retainers means another operation and another set-up.

Analysis of all machining costs, including the necessary jigs and fixtures, indicated that the per piece costs would be far greater by standard shop machining than by investment casting. Further, the initial costs for the two investment castings needed appeared to be considerably less than the tooling costs for machining.

The latch parts have, therefore, been made as brass investment castings by the National Precision Casting Co. Only one dimension is critical on this latch and that is the clearance between the fixed and the movable parts. Generally this clearance is held to 0.003.

After the parts are received from the foundry they are drilled for the hinge pin, the only machining operation that is necessary. Since the final surface finish is specified as dull black, the brass parts must first be copper plated and then blackened by the Ebonal process. Copper plating is necessary in this case since brass tends to produce a dark gray instead of a true black.

*Chief Engineer, Buhl Optical Co. Pittsburgh, Pa.

PREDICTS SHELL MOLDING WILL USE 50 MILLION LBS OF RESIN PER YEAR

Improvements in the shell molding process eventually may result in as much as a 50 percent reduction in the amount of phenolic resin required to produce each mold.

The prediction was made by Edmond S. Bauer, manager of industrial resins sales for Monsanto Chemical Company's Plastics Division, in an address delivered before the Chemical Market Research Association.

Describing the foundry as a market for the chemical industry, Bauer said the shell molding process is slated for healthy, regular growth. He said the trend toward process improvement indicates that eventually resin usage per mold may be cut in half. (Currently, shell molds contain about six percent resin by weight.)

To illustrate how quickly foundries have adopted shell molding, Bauer pointed out that the process, which used only insignificant quantities of phenolic resin in 1950, chewed up more than three million pounds of resin in 1952.

Bauer predicted that this year the shell molding process would consume between eight and 10 million pounds of resin. By 1957, he estimated that the figure would top the 50,000,000-pound mark. He brought the figure into prospective by pointing out that in 1952, only 64 million pounds of phenolic resin was utilized in making thermosetting molding powder.

DUE TO THE NATURE of the mold material, non-ferrous castings can be produced which are dense, stress-free, smooth and accurate. The self-venting character of permeable gypsum plaster molds allows gas to escape, thus preventing porosity. Photo courtesy of Atlantic Casting and Engineering Corp.

How Plaster Molds Assure Production of Sound Castings

EXPENDABLE MOLDS are characteristic of the plaster mold casting process. In this feature, they are not different from several other casting methods: in sand casting, investment casting and shell mold casting, the mold is likewise destroyed with each casting cycle.

Plaster mold casting is unique in the material from which the expendable mold is made and the manner in which the molds are proccessed.

In the plaster mold casting foundry, the basic material of the molds is a specially formulated gypsum plaster which is mixed into a slurry and poured over machined brass patterns to form cope and drag sections. The mold halves are removed and oven-dried.

At this stage, the mold has developed certain properties which contribute to the making of sound metal castings. Gypsum plasters are available which, when properly mixed, poured and dried, have extremely high permeability. This permits the escape of gases during casting so that the mold is, in effect, self-venting. This reduces internal porosity in the casting to the point where uniformly dense metal structure is obtained.

On the other hand, the dry plaster molds are hard enough to be handled, stored and assembled with reasonable care. Gypsum plaster can be cast into small core boxes to form smooth-surfaced, firm, easily handled cores for internal

continued next page

Life of plaster mold patterns is long, cost is low . . .

contours of the castings. Accuracy and surface quality of the interior surfaces can thus be maintained equivalent with exterior casting surfaces.

As metal solidifies, it expands. The yielding nature of the plaster mold is such that this metal is not restrained during shrinkage. Castings that are substantially stress-free are thereby obtained.

The liquid slurry of plaster which is poured over the brass pattern has almost no effect upon the pattern, having neither abrasive nor corrosive action. The life of these brass patterns is unlimited.

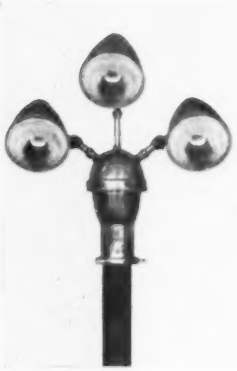
Because brass is entirely satisfactory as a pattern material for plaster molds, faster machining and less tool expense is involved than is true of the "permanent" types of molds which are machined from steel.

Various methods have been devised for mechanizing plaster mold casting for quantity production. Many castings are produced in lots of several thousand pieces; however, it is also practical for small runs of castings. As a result, large volume parts, such as electrical motor brush holder are plaster mold cast and, also, experimental castings which are subsequently to be cast by some other method.

Each metal fabricating method has its limitations, as well as its peculiar advantages. In plaster mold casting, one limitation is introduced by the mold material. It is not practical to cast the ferrous alloys, but is limited to the brasses, bronzes, aluminum and similar alloys.

HERE IS ANOTHER PLACE that die castings have proved to be less expensive than sand castings.

Weather-wise Die Castings Save on Labor Costs

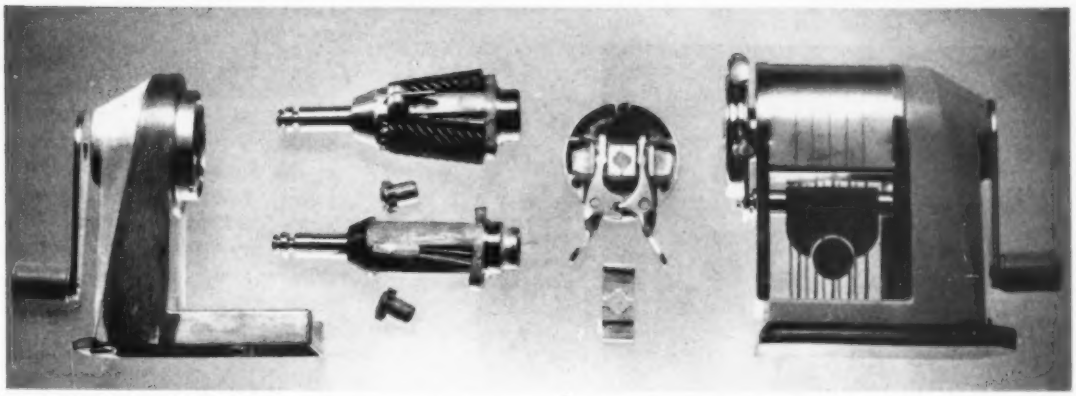


TEN YEARS AGO, when the Rutledge Equipment Co. of Pittsburgh, Pa. first designed the connector unit for their overhead flood and spot lights it was apparent that the use of a zinc die casting instead of a sand casting would result in a far less expensive unit. This was, of course, prior to the sky-rocketing of labor costs so that at today's prices the saving shown through die casting would be even more pronounced.

The connector in question is illustrated above. Functionally, it connects the head unit on which the lamps are mounted to the pipe support used to elevate the lights above the ground. From a strength point of view almost any castable material would do the job. No particularly critical dimensions are involved and, since the final finish is generally paint, surface finish is not critical.

In fact, there is only one critical requirement on this piece — the two bores must be concentric and be held, dimensionally, within the OD tolerances for pipe.

At the time the part was first put into production, the die charges were about the same as the pattern costs for sand casting and the improved accuracy of the die casting process made machining completely unnecessary. As made by the Pittsburgh Dies and Casting Co. the connector is ready for use as received except for drilling and tapping three set screw holes in each flange.



1. CANTILEVER LOADING is accommodated by central bearing which is cored into main support column. Zinc is good bearing material, so that no bushing insert is needed.

To Obtain Rigid Structure With Thin Walls Use a Zinc Die Casting

By C. J. KOSTRZEWA*

WHY should a design engineer change from sand castings to die castings? The most obvious reason is to lower production costs but equally important is to increase the output of an existing plant without having to increase floor space or to purchase new machine tools.

The pencil sharpener illustrated here embodies the advantages noted above and others peculiar to zinc die castings. Because this model is portable for desk top use, the base must be relatively large to give stability.

Again because of the peculiar design of this pencil sharpener, only one bearing can be used on the cutting head, thus requiring a rather long single bearing to take the cantilever load. This long bearing necessitates a heavy section at the top of the main support column so that for eye-appeal the entire column must be made relatively large.

If all of these requirements were to be encompassed in a sand casting the mass of the finished part would be much greater than is desirable, if for no other reason than the higher shipping charges. Through the use of a zinc die casting, however, all of the desirable features can be incorporated and the weight kept quite low.

Figure 2 shows the frame casting in two views. The thin walls, generally less than 1/16 inch thick, are quite evident as are the stiffening ribs at points of higher stress. This illustration also shows the long bearing with the highly cored areas around it to lower the weight.

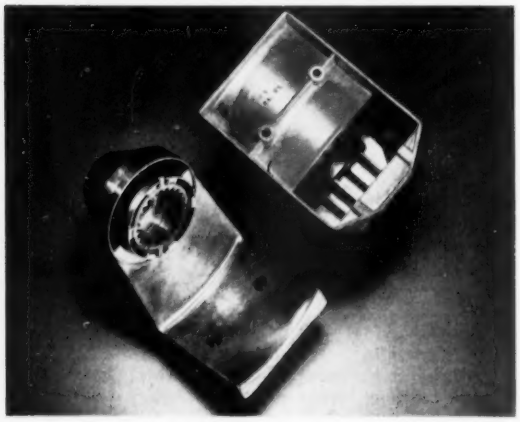
In this same illustration two unique properties of zinc die castings are also evident. Referring again to the bearing, the hole is, of course cored and then reamed no separate bushing is needed since zinc is a sufficiently good bearing material for this application.

The other special property is the ability of a zinc die casting to be deformed plastically to a major extent without fracture. Advantage is taken of

continued next page

*Plant Superintendent, Apsco Products, Inc., Rockford, Ill.

Zinc bearing and cold forming properties used



2. STAMPED ring gear is held in place by staking the die cast zinc alloy.

this in staking the ring gear in place on the cast in supports. Because this mode of assembly can be used, a stamped ring gear may be employed.

Except for counter-boring the two holes in the base no other machine work is needed on this part. Surface finishing is simple since the as-cast surface needs no preparation other than cleaning after the flash and gate have been removed.

On the other die castings used in this pencil sharpener the same line of thinking was followed that led to the use of a die cast body. The cutter head is cast with the steel shaft cast as an insert. After trimming the head is faced where the shaving container goes over it and the two screw holes that hold the hardened cutters in place tapped.

The die cast gears are used as cast and are pressed into the cutters prior to assembly of the head. Finally the chuck head is a chromium plated zinc die casting that is used as-cast except for tapping the three holes to fasten on the cover plate.

Powder Metallurgy vs Gear Shaping--8000 vs 32 Per Day*

"WE have all seen military production in two recent wars cause major dislocations in materials and tools, including machine tools. As one of the Ordnance Machine Tool Control Officers during 1951 and 1952 it was my duty to allocate delivery of the pitifully small quantity of machine tools available to the places where they would do the most good.

"Twenty-month delivery was not uncommon on some types. On many occasions I knew of plants idle though otherwise fully equipped, lacking only one machine to enable production of critical items. We were at war!

"Screw machine capacity was fully engaged. In 1951 there was only one special gear shaper in all the United States on which certain non-circular precision gears could be made. **This shaper produced one gear every 15 minutes — 32 per day — and there were 4,000 pairs required for the fire control instrumentation on the Patton tank. Three metal powder fabricators said they could be tooled within 30 days and would deliver all 8,000 gears in less than one day's production on a single hydraulic press.** The highest cost estimate was one dollar against a cost of over $3.00 each produced on the shaper . . . "

"The largest tonnage of commercial iron powder sold today is that produced directly from beneficiated ores by the Swedish sponge iron process. Compare the number of operations required to produce even a simple spur gear from mine to gear by powder metallurgy, and by machining from bar stock. If you want a real surprise then compare the cost.

"If, in your business, you use a large variety of sizes and shapes of gears, cams and the like now compare the raw material procurement and stock level problems as compared to having all sizes and shapes come out of the same pail of powder. The variety lies in the tools which in most cases you would design and make yourselves.

"And forget about scrap metal to sort and recover. There just isn't any. Compare the steps **from iron powder to press and sintering furnace versus iron concentrates to blast furnace to billet to bar to blank to gear cutter to finish and to furnace. Then clean up the scrap.** Compare the relative investment in equipment and tools. Here you will observe the economics and economy of powder metallurgy expressed in time and money. The results of the study will astound you . . . "

*Excerpts from a paper "The Significance of Powder Metallurgy in Mass Production and the National Defense" presented before American Society of Tool Engineers, Greater New York Chapter, by John D. Dale, President, Charles Hardy, Inc.; member Metal Powder Association.

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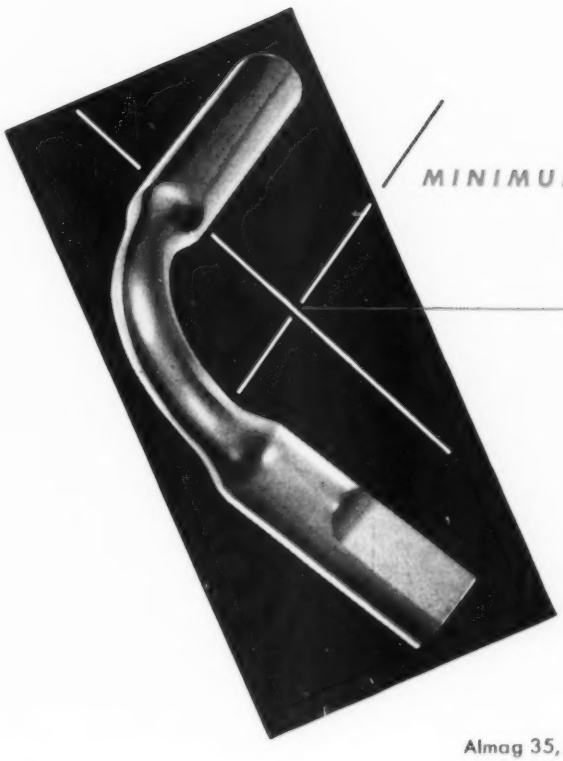

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New Books on Metallurgy

METALLURGICAL DICTIONARY by J. C. Henderson and J. M. Bates; Reinhold Publishing Co., 330 W. 42nd St., New York 36, N. Y. price $8.50.

This dictionary fills a long-felt need in the metallurgical literature. Over 5000 terms are defined using, for the most part, the nomenclature and definitions that have been developed and adopted by the various metallurgical societies and the ASTM. Arrangement is simple and logical so that any of the terms defined can be quickly located. Cross referencing is thoroughly adequate.

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PROTECTIVE ATMOSPHERES by A. G. Hotchkiss, H. M. Webber; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. price $7.00.

The authors, unquestioned authorities in the field of protective atmospheres have given a thoroughly comprehensive coverage to the subject. Both basic theoretical considerations in the generation and use of atmospheres as well as detailed examination of atmospheres for specific purposes are covered.

Some of the chapter headings are: Typical Protective Atmospheres; Basic Chemical Reactions of Gases Used for Furnace Atmospheres; Atmospheres for Preventing or Reducing Oxides; Atmospheres for Preventing Decarburization; Atmospheres for Carburizing, Carbon Restoration and Nitriding.

Instruments for Analyzing, Controlling, and Measuring Gases; Storage, Distribution, and Handling of Gases; Applications of Protective Atmospheres; Remedies for Protective Atmosphere Ailments.

TEMPERATURE MEASUREMENT IN ENGINEERING by H. Dean Baker, E. A. Ryder, and N. H. Baker; John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. price $3.75.

This is volume I of a two volume work designed to present in a convenient non-mathematical form the information necessary to engineers who wish to measure temperature. Vol I covers methods for measuring temperature, precision requirements, affecting conditions, various measuring devices and circuits, and techniques for making temperature measurements particularly with thermocouples. Adequate references both as to source material and for more detailed information are given at the end of each chapter.

PMM

Finishing Section

SURFACE FINISHING

Most precision metal molded parts receive some type of surface finish such as plating, organic coating, anodic coating, or chemical coating. This section includes information on the methods, processes and equipment used in these surface treatments.

A Section Devoted to Specialized Finishing of

Die Castings • Investment Castings • Powder Metal Parts
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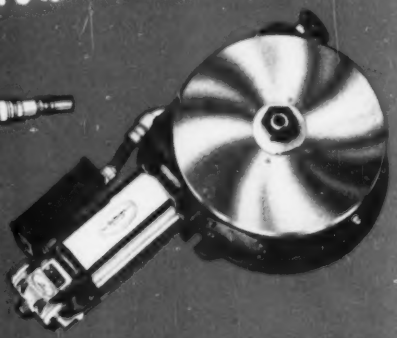

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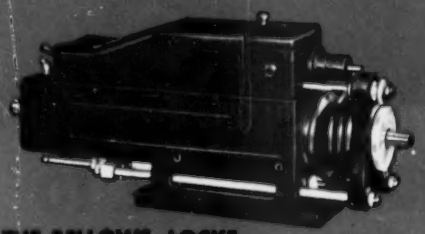

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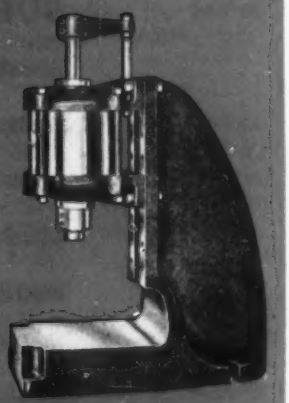

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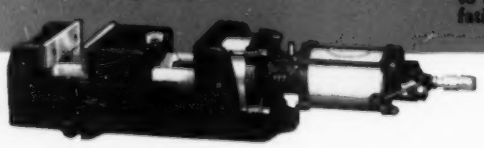

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ORGANIC COATINGS can be applied successfully to magnesium die castings. Surface preparation techniques and materials have been well established so that paint adhesion and corrosion resistance are achieved.

Finishing Systems for Magnesium

By HUGO A. BARBIAN*

IS magnesium the tough finishing problem some people think it is? To answer that question, I'd like to explore (1) requirements for finishing magnesium, (2) finishing systems currently used, (3) service experience of magnesium finishes, and (4) new developments for finishing magnesium.

Basic requirements for finishing magnesium

The first consideration for finishing material is obtaining a surface free from contamination. This is necessary for best finishing results and for maximum corrosion resistance. Magnesium may have several types of contamination which must be eliminated. Soils may be removed from the surface with conventional vapor degreasers and alkaline cleaners. An alkaline cleaner of the heavy duty type designed for steel with the pH above 11 is very satisfactory for magnesium.

Magnesium sheet products may have mill scale or heavy metals rolled into the surface. This contamination should be removed with acid pickles for maximum corrosion resistance. Any acid pickle which will remove 0.0005" of metal per surface is acceptable, but the acetic-nitrate pickle has been found best. Sheet products may be purchased from suppliers in this pickled condition. Sand blasting of magnesium castings increases the corrosion rate markedly, so the blasting should be followed by an acid pickle. It is common practice to perform this operation in the foundry before the shipment of a casting to the customer. Any acid pickle which will remove 0.002" of metal per surface will serve to remove the effects of blasting; the 8% nitric- 2% sulfuric or 2 to 3% sulfuric acids are the most commonly used. Chemical treatments like Dow #17* or HAE remove such surface contamination and sandblasting effects in processing and thus require no previous acid pickle.

Magnesium surfaces, like zinc surfaces, are naturally alkaline. To retard the formation of free alkali at the surface of the metal, a chromate-containing treatment, should be selected. Certain primers which are compatible with alkaline surfaces can be used on bare magnesium with good ad-

continued next page

*Technical Service and Development, Magnesium Department, The Dow Chemical Company.

These are excerpts from a paper presented before the ninth annual meeting of The Magnesium Association in October. (See page 39.)

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3M

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hesion. These primers contain vinyl, epichlorhydrinbisphenol, or polyvinyl butyral resins.

Another basic consideration concerns the use of a chemical treatment for paint adhesion. This is a common practice for all metals. Paint adhesion can be obtained mechanically on magnesium with such treatments as the Dow # 1 chemical treatment. In a treatment of this type, a selective etching makes a "tooth" into which the paint is locked.

Paint adhesion can also be obtained by absorption. The anodic treatments for magnesium such as Dow #12, #14, Manodyze, #17 or HAE are coating, which will absorb paint, oils, greases, and other such materials very readily. It appears that the Dow #8, #7, #9 and #10 coatings also hold paint by absorption.

A significant phase of magnesium finishing calls for good design and protection of dissimilar metal joints. This becomes especially important where equipment is used in salt-containing environments like sea coast sites or on the underside of automobiles and trucks. In these cases, improper design can lead to galvanic corrosion.

I'd like to explain galvanic corrosion as simply as possible. In a flashlight, zinc or magnesium metal corrodes and produces light. This is a type of galvanic corrosion. In a water heater, a magnesium rod corrodes and protects the steel tank. This is a common and well-known welcome type of galvanic corrosion which is done deliberately to increase the life of the steel tank. In fabricated assemblies where magnesium is coupled to another metal, the magnesium may corrode and protect the dissimilar metal producing an undesirable type of galvanic corrosion — a type which

*Patent applied for.

must be guarded against. This galvanic corrosion is likely to occur only when an active electrotype contacts the dissimilar metal union.

Proper design to eliminate undesirable galvanic corrosion calls for certain steps: (1) protecting the cathode (dissimilar metal) as well as the magnesium by the use of moisture impervious films such as vinyls. Where corrosion is a real problem, the use of essentially non-porous coatings on magnesium (chemical treatment or paint) should be avoided unless they are appiled to the dissimilar metal as well. It has been a common failing in field work to put more and more protection on the magnesium because it appears as though the magnesium is the member which is corroding and needs protection.

Another factor in proper design which tends to reduce the incidence of galvanic corrosion is the use of dissimilar metals which are compatible with magnesium.

These metals are:

Aluminum — 52S, 53S, 61S and 63S

Steel, Brass, etc. — use zinc or cadmium plate*

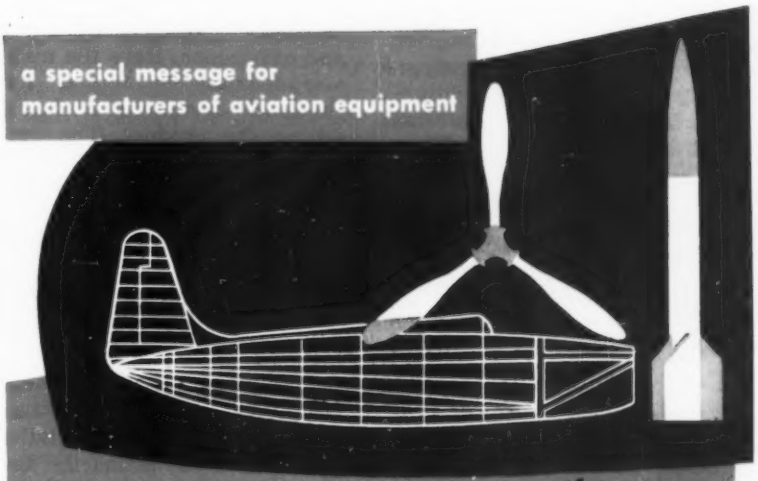
These metals can be used as washers, shims, fasteners and structural members.

Proper design of magnesium structures calls for the use of non-absorbent tapes or sealing compounds in joints. A tape or sealing compound is used between the magnesium and the dissimilar metal with at least 1/8 to 1/4" overlap so that bridging by the electrolyte cannot occur.

Another means of reducing galvanic corrosion is by use of electroplated magnesium. A copper-nickel-chromium system eliminates the potential difference between the magnesium and the dissimilar met-

*retards galvanic corrosion but does not prevent it.

a special message for manufacturers of aviation equipment



need a finish for light metal parts? specify IRIDITE®

Here's the finish that combines corrosion resistance and paint adherence with extreme ease of application. It can be welded or soldered with no difficulty and presents no problem in "patching" scratches, marks or scraped sections. Here's what you can do with Iridite:

ON ZINC AND CADMIUM you can get highly corrosion resistant finishes to meet any military or civilian specifications and ranging in appearance from olive drab through sparkling bright and dyed colors.

ON COPPER . . . Iridite brightens copper, keeps it tarnish-free; also lets you drastically cut the cost of copper-chrome plating by reducing the need for buffing.

ON ALUMINUM Iridite gives you a choice of natural aluminum, a golden yellow or dye colored finishes. No special racks. No high temperatures. No long immersion. Process in bulk.

ON MAGNESIUM Iridite provides a highly protective film in deepening shades of brown. No boiling, elaborate cleaning or long immersions.

AND IRIDITE IS EASY TO APPLY. Goes on at room temperature by dip, brush or spray. No electrolysis. No special equipment. No exhausts. No specially trained operators. Single dip for basic coatings. Double dip for dye colors. The protective Iridite coating is not a superimposed film, cannot flake, chip or peel.

WANT TO KNOW MORE? We'll gladly treat samples or send you complete data. Write direct or call in your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified phone book.

Iridite is approved under government specifications

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Manufacturers of Iridite Finishes for Corrosion Protection and Paint Systems on Non-Ferrous Metals, ARP Plating Chemicals.
WEST COAST LICENSEE: L. H. Butcher Co.

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al and thus eliminates galvanic corrosion. This method is especially applicable to small parts.

Finishing systems currently used on magnesium

Five main finishing systems are currently being used on magnesium parts.

1. **Producer's paint base treatment.** A typical example of this system is the use of Dow #1 or chrome-pickle treatment on magnesium die castings or truck body sheet and extrusions. Here the magnesium supplier applies the chemical treatment before selling the product. The customer performs very minor cutting and drilling operations and then applies an organic finish directly to the chemical treatment.

2. **Bright metallic finish.** This finish can be obtained with the Dow #15 treatment on wrought products or the Dow #16 treatment on cast products. The bright metallic finish is used primarily for sales appeal and shelf life. Wax or clear lacquers may be applied for additional finishes.

3. **Black Chemical Finishes.** The Dow #8, and Dow #9 treatments are used primarily where black chemical finishes are desired on surfaces which will receive no subsequent organic finish.

4. **Electroplating.** The use of electroplated magnesium has not been too widespread in recent years, primarily because of the nickel shortage since the Korean crisis. This year several production products are being electroplate and we expect the use of this finishing system to grow.

5. **Paint base treatment.** This is one of the most widely used, and is differentiated from the producer's paint base treatment in that this chemical treatment is applied by the fabricator after all fabricating operations are completed and immediately before application of the organic finish. The treatments which may be used are Dow #1, #7, #8, #9, #10, #12, Manodyze, #17, HAE, and Iridite, #15. Of these, the Dow #7 is the most widely used.

Serviceability of magnesium finished parts

Producer's Paint Base Treatment. Many commercial products which have been given the producer's paint base treatment and an organic finish have been in service for many years. Some of these are automotive parts with 15 years of service. The parts are primarily die castings which have been given a chrome pickle by the die caster and a coat of baked enamel by the automobile manufacturer. On parts such as convertible hardware, which are exposed to the elements, a coat of primer was incorporated into the system.

Chairs of various types have been in use for over 15 years. These chairs incorporated a

It's practically
WATER-WHITE
a NEW
chemically resistant
baking finish—
DURACHEM

For all types of metal products from heavy hardware to fine jewelry

Here is a new baking type synthetic finish for metal parts that combines unusual clarity with a high degree of chemical resistance.

Product of Maas & Waldstein Co. research, DURACHEM is almost water-white in color—and retains its clarity even after prolonged exposure to heat and sunlight. It also protects metal parts against the effects of salt spray and perspiration.

Typical applications include builders' hardware, vanity and cosmetic cases, lipstick shells and pen caps.

Where decorative color effects are desired on metal, DURACHEM can be supplied in a range of colors with the same chemical stability as the clear finish.

Samples and technical literature are available on request. Or an M & W technical consultant will discuss your requirements privately with you.

MAAS & WALDSTEIN CO. NEWARK 4, NEW JERSEY

Midwest Div., 1638 Carroll Ave., Chicago 12, Ill.
Pacific Coast Div., Smith-Davis Co., 10751 Venice Blvd., Los Angeles 34, Calif.

MANUFACTURERS OF INDUSTRIAL FINISHES

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baked enamel system over Dow #1. Other chairs have been produced in quantity for more than 5 years with excellent serviceability.

Bright Metallic Finish. The bright finish has been used on magnesium ladders for over 5 years and on hand trucks for over 2 years. We normally expect that these parts will remain bright for about a year, but many of the ladders are still very attractive after considerably longer use. In the case of ladders and hand trucks, no wax or lacquer film is applied after treatment.

Black Chemical Finishes. Binoculars and camera parts requiring the black chemical treatment show excellent stability after 10 years of service. The black treatment without an organic finish is applied to the inside for best optical effects. The outside is given a conventional baked wrinkle finish or covered with leatherette.

Electroplating. Satin chrome finishes have been applied to die cast portable saw parts for 5 years. Serviceability has been excellent. In this case the satin chrome finish was selected to match the brushed finish applied to the aluminum die castings on the saw.

Paint Base Treatment. As was pointed out earlier, the paint base treatment is the most widely used. Space does not permit an extensive coverage of the serviceability of systems employing it. We can glance at a few of the more prominent applications. The B-36, one of the largest applications, has been in use for more than 7 years. Serviceability has been excellent, and although there have been some finishing troubles, proportionately, these troubles have been minor.

Recording machines have been an excellent application for magnesium die castings as light weight is of primary importance. Serviceability of the magnesium has been excellent. We recently reviewed the complaints of one manufacturer and found that in the few cases where some corrosion had been noted on the magnesium parts, the exposure had been extremely severe and that other metals on the same unit had corroded to such an extent that in many cases this corrosion interfered with the operation of the unit. In no case did magnesium corrosion interfere with the functioning of the equipment. Finishing systems used are either Dow #7 plus primer plus baked enamel or Dow #7 plus primer-surfacer plus lacquer.

Serviceability data indicate (1) that magnesium can be finished properly to do the intended job, (2) that a variety of acceptable finishes is available, and (3) that proper design is important for maximum corrosion resistance.

PLATE SMALL PARTS IN A BIG WAY
with the DANIELS OLS

#4 OLS
in unloading position

For plating die castings, stampings, screw machine parts, castings or any small parts in bulk, this Daniels *OLS Oblique Plating Barrel* is unsurpassed.

Our barrels can do the best job for you—*Write today for our new illustrated catalogs which explain why.*

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DANIELS

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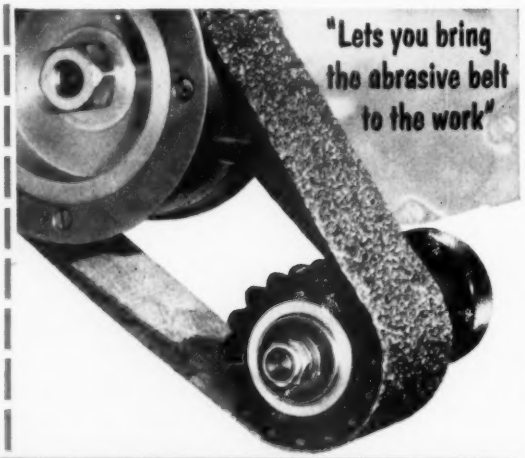
ASTE HEARS TALK ON BARREL FINISHING

The New York chapter of the ASTE at a recent meeting devoted the technical discussion to barrel finishing methods and equipment. Principal speaker was Lee Watkins, director of sales for the Almco Supersheen Div. of Queen City Stove Works, Inc.

The talk was designed to show the difference between older finishing methods and modern barrel finishing operations. Seven basic operating conditions were thoroughly described. Watkins stated that by controlling these seven conditions almost all types of metal parts can be deburred, ground, polished, burnished or descaled.

A complete description of the various medias and compounds was given, along with information as to how they should be used. Numerous examples were used and specific instructions as to how the various parts were run was explained.

Finish FASTER with BELTS ...at less cost!



4 MODELS "61" Port-A-Belt GRINDING ATTACHMENTS

"Production costs cut up to 50%...finishing time reduced as much as 60%," report users of CARBORUNDUM's PORT-A-BELT Grinding Attachments and CARBORUNDUM® Brand Abrasive Belts. You may find, as many have, that converting straight-spindle grinders to fast, efficient belt grinders will reduce costs even more than 50% on such varied jobs as weld grinding, small-radius cleaning and polishing, or finishing convex or concave surfaces. Four sturdy models, built to take more than normal shop abuse. Your choice of 4"x2" or 2"x1" contact wheels — mounted on the tool spindle or on the extended arm.

All four "61" PORT-A-BELT attachments use CARBORUNDUM's "61" serrated rubber contact wheels. CARBORUNDUM® Brand Abrasive Belts, used with these wheels give smooth, rapid cutting...no bounce or chatter. Belts last up to twice as long because they don't load up as fast. One operation often replaces two or three conventional finishing operations.

CALL YOUR CARBORUNDUM DISTRIBUTOR OR SALESMAN, listed in the yellow pages under "Abrasives," and find out how you can apply the versatility and economy of belt grinding to your production jobs. Or send the coupon.

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...continually putting more cents in your abrasive dollar!

SEND TODAY!

THE CARBORUNDUM COMPANY, Dept. PM 82-38, Niagara Falls, N. Y.
Yes! Send me your folder on "61" PORT-A-BELT Grinding Attachments.

NAME AND TITLE

COMPANY STREET AND NUMBER

CITY ZONE STATE

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NON-ALLOCATED NICKEL ANODES NOW AVAILABLE

An encouraging announcement for consumers of nickel anodes comes from New Jersey Metals Co. of Elizabeth, N. J. This company formerly did mostly reconversion of anode ends and stubs into new anodes. As a result of increased plant facilities the company is now in position to supply non-allocated standard oval shaped nickel anodes in substantial quantities.

As far as procurement is concerned, the company buys nickel scrap at market prices, melts and casts it in their own foundry and sells it at cost plus the standard casting fee. This places nickel anodes on the market at a price that is directly proportional to the price of scrap since the foundry fee remains constant.

Production is, at all times, under the close supervision of skilled metallurgists and foundry personnel with strict laboratory control exercised to maintain quality.

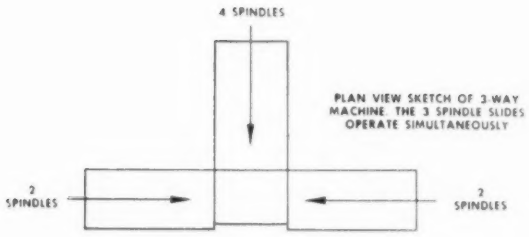
DETREX HOLDS MEETING

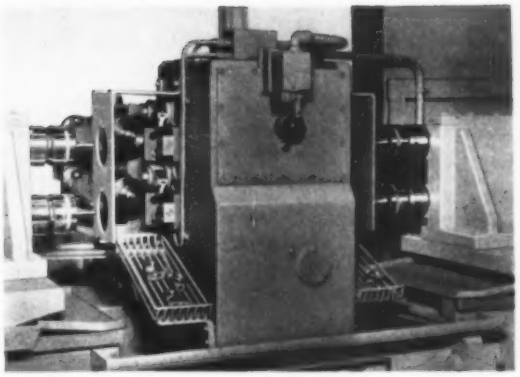
Michigan and Northern Indiana sales representatives of the Industrial Equipment Division of the Detrex Corporation, Detroit, major manufacturer of industrial metal-cleaning machinery and chemicals, have concluded a conference at the Hotel Fort Shelby on "creative selling."

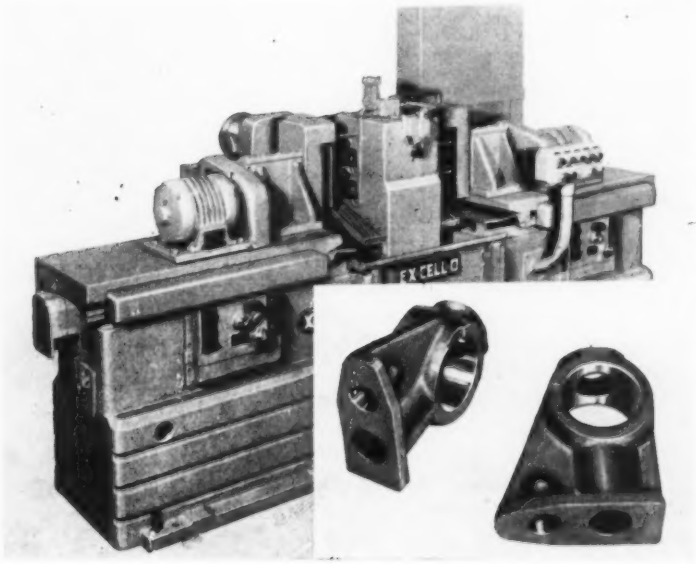
The conference was presided over by David E. Williard, sales manager of the division.

A. O. Thalacker, Detrex president, addressed the group at luncheon and reported that the consumption of industrial cleaning solvents in the country this year represented a 20 percent increase over 1952.

Use of ultrasonic waves to clean intricate metal parts, a development pioneered by Detrex, was demonstrated at the conference.







BECAUSE of their inherent accuracy, die castings are well suited for high production, precision machining setups such as this one. At left are shown a boring machine and the die cast work pieces; above left is a plan diagram; above right is a close-up of the operation.

Auto builder bores precision holes in 822 DIE CASTINGS PER HOUR

BORING two holes at right angles to each other in an aluminum die casting was recently a problem for a major automotive manufacturer. High precision was required and, at the same time, high production rates had to be maintained.

A three-way boring machine setup solved the problem, boring one through hole 13/16" in diameter and one blind hole 5/16" in diameter within tolerance of ± .0005 on diam.

Rate of production established is 882 parts per hour. The castings and machining set up are illustrated here. Since die castings are extremely uniform as cast, they lend themselves readily to this type of precision machining operation.

The Ex-Cell-O three-way precision boring machine consisting of three standard, self contained way units joined to a center section, provides rapid cycling.

The left and right way units have two spindles each, as indicated in the plan diagram, mounted one above the other on angle plate brackets.

The rear slide carries four spindles, two on each side. In the center section is a double fixture holding two die castings on each side, clamped and ejected hydraulically.

The operator loads four parts, presses the clamp button and the start cycle button. The three slides advance simultaneously, bore two holes in all four castings, and then retract. As the slides withdraw, the work is ejected automatically, to complete the machine cycle.

PARKER-KALON®

originator and world's largest producer of hardened Self-tapping Screws, and a leading manufacturer of Socket Screws and other fasteners, is now a Division of General American Transportation Corporation

GENERAL AMERICAN, with principal offices in Chicago, owns and operates the nation's largest private fleet of freight cars which are leased to many of the foremost industrial companies, and to railroads. In addition, it is a major builder of all types of freight cars, owns and operates tank storage facilities, and is engaged in the manufacture of process equipment and molded plastics.

In pursuance of a program of diversification, General American has acquired the business and assets of the Parker-Kalon Corporation through the purchase of capital stock. The business will henceforth be operated as the Parker-Kalon Division of General American Transportation Corporation.

The present management of Parker-Kalon will continue in charge. The sales and service policies which have won the approval of the many thousands of P-K customers will remain in effect. As always, P-K Fasteners will be sold through P-K Distributors in every industrial area in the United States, Canada and in many foreign countries.

With the far greater resources available through its new ownership, Parker-Kalon will accelerate a program of improvement and expansion. New production and warehouse facilities will be built to meet the constantly increasing demands for P-K fasteners. Engineering and research will be augmented to speed the perfection of new P-K products now in development.

Now, even more than before, you can rely on Parker-Kalon for leadership in fastener design, for consistently high fastener quality, and service in step with your needs.

P-K TRADE MARK REG. U.S. PAT. OFF.

PARKER-KALON®

Division

General American Transportation Corporation
200 Varick Street, New York 14, N. Y.

GENERAL AMERICAN

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USEFUL LITERATURE

To receive copies of the publications described here circle key number on reader service card bound in this issue.

PROCESSES

Better Castings by Shell Molding 144

That is the title of a bulletin issued by Builders Iron Foundry describing the shell molding process and giving typical applications of castings made by the process.

Industrial Organic Chemicals 145

A four page brochure listing intermediates, plasticizers and solvents giving the properties of the various materials of each type is available from the Celanese Corp. of America.

New Shell Molding Booklet 146

An all new, thoroughly illustrated booklet describing their shell molding facilities and giving examples of castings made by the process is now available from the Lynchburg Foundry Co. Included are data on composition and minimum tensile strengths of available irons.

Precision Cast Valve Parts 147

A one page reprint describing the advantages of the frozen mercury process in the production of high vacuum pump valve parts is available from Alloy Precision Casting Co.

Ductile Powder Metal Parts 148

Highly ductile parts can now be produced from iron powder. A description of the properties of such parts and illustrations of some pieces are contained in a brochure published by the Amplex Div. of Chrysler Corp.

The Investment Casting Process 149

A short description of the investment casting process and some examples of investment cast parts are contained in a brochure from Arwood Precision Casting Co.

Permanent Mold Casting 150

How quality control in the foundry insures better permanent mold castings is described in a brochure recently issued by the Permold Co.

Non-Cutting Tool Applications of Carbides 151

In a thoroughly illustrated booklet, the Sintercast Corp. of America describes many of the applications of sintered carbides that are non-cutting. Included are deburring tools, draw dies, forming dies and many others.

Shell Mold Casting Facilities: 152

A contract shop that produces shell mold castings in gray iron, aluminum and brass offers a new brochure showing its facilities, some of the castings now being produced, and giving information about the applications of shell mold casting. The company is Woodruuf & Edwards, Inc.

MATERIALS & EQUIPMENT

Powder Metallurgy Presses 155

Designed specifically for powder compressing, eight new presses built by the Kux Machine Co. are described in a new leaflet now available. Capacities range from 30 to 500 tons with varying depths of fill, speeds and piece diameters.

Die Casting Machines 156

Describing in detail the complete line of die casters, a new bulletin graphically presents the features incorporated into the Lake Erie Engineering Corp. designs. Complete specifications are furnished on the standard machines.

Facts about Silicon Carbide 157

In a 52 page booklet, the Carborundum Co. describes the properties, history, uses, etc. of silicon carbide. The booklet contains a wealth of engineering and technical data as well as a bibliography of pertinent material.

Stainless Steel Fasteners 158

A complete catalog of the entire line of stainless steel fasteners manufactured by Star Stainless Screw Co. is now available. In addition to the fasteners, pipe fittings, valves and many other products of the company are given.

Bonding Aluminum to Ferrous Alloys 159

A process, "Alumibonding", for applying a layer of aluminum or its alloys to ferrous metals and alloys is described in a booklet issued by the Arthur Tickle Engineering Works. The bond between the dissimilar metals is said to be permanent and strong.

Non-Flammable Industrial Liquids 160

An eight page safety folder describes four products of E. F. Houghton & Co. designed to reduce fire hazards in plants employing hydraulic fluids, rust preventatives, cleaners and cutting compounds.

Detection of Surface Flaws 161

The use of water soluble dye penetrants for the detection of surface cracks and flaws is described in leaflets available from the Met-L-Check Co.

Industrial Radiography 162

The use of X-rays as a non-destructive inspection method to detect subsurface cracks, holes, and other macroscopic flaws is fully described and illustrated in an eight page bulletin issued by Industrial X-Ray, Inc.

Super-Sensitive Small Hole Drill 163

A new small hole drill said to be super-sensitive for precision drilling is described and illustrated in a brochure available from the Hamilton Tool Co.

Jig and Fixture Components 164

A newly completed two-color folder describing a greatly expanded line of jig and fixture components is announced by the Jergens Tool Specialty Co. According to the manufacturer the expanded line contains over 500 different items designed to lower tool die costs by furnishing precision built components that formerly had to be made by high priced die sinkers.

continued next page

DO REJECTS SLOW UP YOUR PRODUCTION LINE?

OAKITE PAINT STRIPPERS MAY HELP YOU BREAK THE BOTTLENECK

When painting rejects slow production, you may need one of the stripping methods described in "How to STRIP PAINT", a free booklet which answers many questions about effective stripping procedures. For example:

¶ What's the best way to strip paint from metal parts too large to be soaked in tanks? *See page 3.*

¶ What is the cheapest way to strip metal parts in large volume? *See page 9.*

¶ What strippers are best for removing oil-base paints? . . . Synthetic enamels, alkali-resistant plastics or resin-base paints? . . . Japans, wrinkle finishes, nitrocellulose lacquers, alkyds, phenolics and ureas? *See page 12.*

FREE For a copy of "How to STRIP PAINT" just send us the coupon.

SPECIALIZED INDUSTRIAL CLEANING

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MATERIALS • METHODS • SERVICE

Technical Service Representatives in Principal Cities of U. S. and Canada

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Send me a FREE copy of "How to STRIP PAINT." Also, tell me about your methods for removing the following organic finishes:

Name _____

Company _____

Address _____

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USEFUL LITERATURE — cont.

Non-Ferrous Induction Furnaces 165
Melting of non-ferrous metals and alloys by induction heating is the subject of several new booklets that are available from the Ajax Electrothermic Corp.

Lubrication of Machine Tools 166
Making machine tools operate better and last longer through the proper use and selection of lubricants is the subject of an 80 page book published by the Shell Oil Co.

Self Aligning Swivel Joints 167
A 12 page bulletin has just been published by the Barco Mfg. Co. describing their set aligning swivel joints for piping. All types of joints together with suggested applications are covered in the bulletin.

News of Die Casting & Die Casting Machines 168
The Lester Press, a quarterly devoted to die casting machines and die castings can be secured from Lester Phoenix, Inc.

Wire Thread Inserts 169
The applications of stainless steel wire thread inserts are fully described and many applications given in a brochure available from the Heli-Coil Corp.

continued on page 76

Maintain steady production "reduce down time"

No Trick to it!

With Procunier Tapping Heads

Whether it's light, medium, or heavy tapping, for short or long periods Procunier Tappers are performing with a new found ease, a more dependable and consistent accuracy and providing many extra hours of tapping efficiency. They maintain quality and reduce spoilage and breakage to a minimum.

Here are just a few "reasons why": New, sensitive double-cone friction clutch automatically regulates driving pressure with a soft "cushioned" action; simple, one shot lubrication; ballbearing equipped; heat treated gears with a special gear reversing mechanism; unique double supported tap holding spindle; lightweight housing; exclusive Tru-Grip Tap holder; plus other important features.

Write for free circular

giving full details and specifications on the remarkable line of Procunier Tapping Heads

Procunier

Safety Chuck Company

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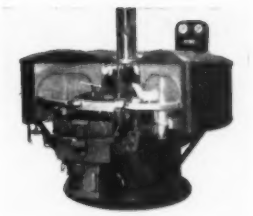
NEW PRODUCTS

For additional information on these products circle key number on reader service card bound in this issue.



SHELL MOLD MAKER
. . . produces 4 molds per minute

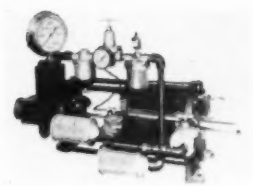
A new shell mold making machine known as the Mark V has been introduced that is said to make shells at the rate of four or more per minute. Utilizing a four station working cycle the machine will accommodate patterns up to 12x16 inches.

All controls are conveniently located at the operators station and the cycling is so arranged to give the maximum efficiency of both man-power and machine.

Operations done by man-power are to spray the mold with parting agent and reverse the mold over the bin containing the resin-sand mixture. Roll-over and holding time are automatically controlled as is roll back. The operator then inverts the mold so that the sand mixture is upright. Curing and ejection are handled automatically so that when the mold is again presented to the operator the cured shell can be easily lifted off of the mold.

For maximum efficiency three pattern plates are required. Curing time can be varied as can initial setting time.

Polygram Casting Co., Ltd.
For more information circle No. 196 on the Reader Service Card.

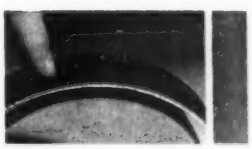


AIR DRIVEN HYDRAULIC PUMP
. . . for small volume & high pressures

A new air driven hydraulic pump has recently been announced. The unit is available in single or double acting models; is a simplex horizontal type, and meets the demand for small volume capacity at medium and high pressures. This pump develops up to 20,000 psi operating on 90 psi air supply; is a self contained machine complete with air filter, regulator, lubricator and hydraulic pressure gauge and can be operated wherever air pressure is available.

This pump provides economy of operation for such applications as testing tubing, valves and pressure vessels, as well as supplying power for small molding presses.

Aldrich Pump Co.
For more information circle No. 198 on the Reader Service Card.



HEAVY ABRASIVE BELT
. . . replaces set-up wheels

Combining the polishing characteristics of hand-coated glue and grain set-up wheels and belts, the new belt offers all the advantages of a coated abrasive belt manufactured under controlled factory conditions.

Originated to replace set-up wheels and belts, the new belt is expected to find wide use throughout the metal working field in such markets as the manufacture of hand tools, cutlery and surgical instruments.

The heavy mineral build-up of the new belt opens up under working pressure, presenting fresh abrasive grain particles to the work piece. This condition may be compared to "cracking" as known in the polishing field when glue and grain coated set-up wheels and belts are used.

Minnesota Mining & Mfg. Co.
For more information circle No. 199 on the Reader Service Card.

continued next page

There's still a NICKEL SHORTAGE! — BUT

Now you can have bright, attractive, wear-resistant chromium plated finishes *WITHOUT THE USE OF NICKEL*

LUSTER-ON® ZINCROME® PROCESS*

provides *excellent corrosion resistance* — up to 50 hours standard salt spray

LUSTER-ON ZINCROME PROCESS

provides *good wear resistance* — the hardness of chrome plate needed for tools, bumpers, etc.

LUSTER-ON ZINCROME PROCESS

provides *accepted brilliant finish* — for outside wear exposure required for automotive trim, etc.

LUSTER-ON ZINCROME PROCESS

provides *economical operation* — high, rugged quality at lowest possible operating cost

LUSTER-ON ZINCROME PROCESS

provides a *precisely controlled "package" process* — 10 easy-to-follow, easy-to-use steps

Specify

LUSTER-ON ZINCROME PROCESS

FOR CHROMIUM PLATED FINISHES WITHOUT THE USE OF NICKEL

Write for free data sheets and send a part for free processing

*Patent Applied for

THE Chemical CORPORATION
66 Waltham Ave., Springfield 9, Mass.

Circle No. 76 on the Reader Service Card

NEW PRODUCTS — cont.

POROUS CASTING SEALANT . . . for micro-porosity

Designed specifically for sealing micro porosity in cast electronic and aircraft parts with stryene base material, varnish or wax; a new type of impregnator has recently been completed.

Castings are loaded into baskets which, in turn, are lowered into the vacuum chamber of the impregnator. The chamber is evacuated, the castings being thoroughly deaerated prior to impregnating.

Impregnating solution is next pumped into the tank. Pressure of 100 psi. is than applied and maintained. After impregnation is completed, excess solution is flushed out through piping in the bottom of the tank.

L. O. Koven & Bros., Inc.

For more information circle No. 200 on the Reader Service Card.

today's **wonder drug** for industry

The greatest cost-saving labor-saving FINISHING DEVELOPMENT in a decade!

SUPERSHEEN SPEED FINISHING does away with costly hand deburring and other expensive hand operations. A single unit replaces from 2 to 12 men. Savings up to 95% on almost ALL types of parts with absolute uniformity, fewer rejects, finer finishes.

Write for NEW FREE 52-Page Catalog

Tells the complete story with latest facts, figures and "before and after" photos.

Dept. D-12

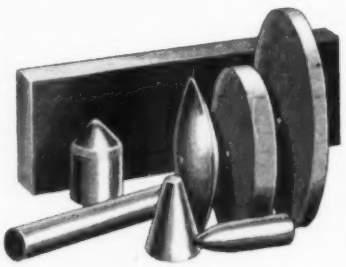
ALMCO Supersheen
AMERICA'S LARGEST MANUFACTURER OF ADVANCED BARREL FINISHING EQUIPMENT — MATERIALS AND COMPOUNDS
ALBERT LEA, MINNESOTA

Circle No. 87 on the Reader Service Card

Reduce Labor Costs — Speed Production with CRATEX

The World's Finest RUBBERIZED ABRASIVES

"cushioned action performance"



There are over 160 standard sizes and shapes of Cratex Rubberized Abrasives available to meet your needs in

BURRING, SMOOTHING and POLISHING operations

Manufactured in four "grit types" from coarse to extra fine, Cratex saves production and labor costs by doing one or more operations at one time—such as Cleaning, Blending, Lapping, Finishing, and Trimming—on hard or soft

METALS, PLASTICS, GLASS and scores of other materials.

CRATEX Rubberized Abrasives
Wheels, Points, Blocks, Sticks, Cones

—are ideal for manual or machine application—require no special equipment—always ready for instant use. For over 30 years, Cratex has served industry with unparalleled results — an unduplicated reputation for lowering "unit costs" in burring, smoothing and polishing operations. Investigate Cratex Rubberized Abrasives . . . "The World's Finest For Industrial Use" . . . send today for Descriptive Catalog which gives full details, applications and prices.

FREE CRATEX TECHNICAL SERVICE

Get the assistance of our abrasive engineers on your burring, smoothing and polishing problems. Merely check the coupon for "Application Analysis Form." This Cratex service will be helpful.

MAIL THIS COUPON TODAY

CRATEX MANUFACTURING CO.
81 Natoma St., San Francisco 5, Calif.

Without any obligation please send us—
☐ Descriptive Catalog.
☐ Application Analysis Form.

FIRM
INDIVIDUAL
STREET
CITY ZONE STATE

Circle No. 77 on the Reader Service Card

SHELL MOLDING MACHINE
. . . with new design features

Specifically designed to increase output and uniformity of mold, a new shell molding machine has been brought out to make precision shell molding machine available at a cost within range of all foundries.

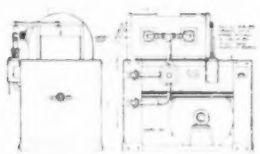
Reported to produce up to two shells per minute, the unit is available with automatic timers for both inversion and curing cycles. It is claimed that use of ball bearing mounted hinged pattern insures positive alignment for precise shell duplication. A new dump box design is said to facilitate even sand fall to increase uniformity and compactness of shells.

Automatic dump box clamps, counter-balanced pattern frame and dump boxes, sealed ball bearings throughout, positive air-actuated shell ejection, thermostatically controlled pattern temperature, and heat-resistant permanently bonded silicone dump box seals are standard features.

Shalco Engineering Corp.

For more information circle No. 203 on the Reader Service Card.

SMALL REVERB FURNACE
. . . for non-ferrous melting



A small reverberatory furnace for melting non-ferrous metals such as aluminum, magnesium and brass has been announced that is said to overcome the two major difficulties heretofore characteristics of this type furnace: the floor space required and control of the furnace atmosphere.

This furnace requires no more floor space than a crucible type of the same capacity and the same degree of atmosphere control can be exer-

continued next page

ENORMOUS SAVINGS IN COLOR DECORATION OF 3-DIMENSIONAL PARTS

ELECTRO-FORMED METAL SPRAY PAINTING MASKS

(Made by Patented Process)

Permit rapid wet painting, one color after another. Clean, sharply defined letters and decorative effects obtained on intricate die castings, stampings and plastic forms by accurate control of painted areas. No fogged edges. After wiping or buffing-off of overspray unnecessary. The "loose" inside of letters and numerals, such as "O" and "6", is held in position by arched bridging to eliminate objectionable "ties". Plug-type masks [keep depressed areas clear, while spraying background]; lip-type masks [protect background while painting depressed areas]; and block-cutout, plane-surface type masks.

Foot treadle air-operated clamps, fixtures and tools which position and hold the piece snugly in the mask; and permit the operator to use both hands.

We design, engineer and build automatic, entirely air-operated machines for spray decorating a variety of small parts at speeds of up to 3600 per hour. Masks inserted flush with top of work table. Spraying is from below. Dials regulate cycling speed and amount of paint sprayed. The same amount of paint is sprayed on every part, regardless of speed of loading cycle. Effect paint savings up to 50% over hand spraying. Employ automatic guns and air-agitated paint pressure tanks with insert containers.

AUTOMATIC, ROTARY-INDEXING PAINTING MACHINE

Completely air-operated or actuated by electric-motor Geneva drive. Machine illustrated has 24 work-holders and indexes 12 times per each complete revolution of the table. The part cavity is eight inches deep and the painting is accomplished on the return stroke, with the work being revolved by a variable-speed air drive.

Speed of stroke during painting regulated by convenient dial. Speed of indexing dial controlled to paint from 400 to 1700 pieces per hour, two at a time. Continuous, circulating paint system. Can be supplied with hot spray equipment if desired. Built for 4-, 6-, 8-, 12- or 24-station indexes or continuous movement.

We also manufacture mask washing equipment.

. . . . . .

CONFORMING MATRIX CORPORATION

Toledo Factories Bldg., Toledo 2, Ohio

Please send without obligation, details on [ ] Automatic Rotary Indexing Painting Machines; [ ] Automatic Single-Spindle Painting Machines; [ ] Hand Masks; [ ] Mechanical Masking Fixtures; [ ] Air-Operated Masking Fixtures; [ ] Stationary, Automatic Spray-Painting Masking Machines; [ ] Rotary Table, Automatic, Spray-Painting Masking Machines; [ ] Mask-Washing Equipment; [ ] Quotations on masks for parts [or prints] which I am forwarding.

NAME.....

FIRM.....

STREET.....

CITY & STATE.....

For additional information Circle No. 61 on the Reader Service Card

AMERICAN CHEMICAL PAINT COMPANY

AMBLER CHEMICALS ACP PROCESSES PENNA.

Technical Service Data Sheet

Subject: HOW TO MAKE PAINT STICK TO GALVANIZED IRON WITH LITHOFORM®

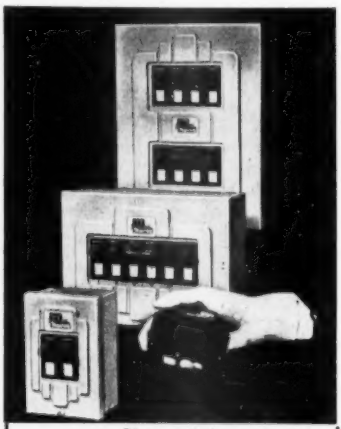
INTRODUCTION

"Lithoform" forms a dense, zinc phosphate coating on zinc, cadmium, and galvanized surfaces—including Galvanneal, cadmium plated steel, zinc plated steel, zinc base alloys, and zinc base die castings. The "Lithoform" coating, which is non-metallic and inactive, retards reaction between alkaline metal oxide and the paint film. Peeling and loss of adhesion are thus greatly retarded on painted Lithorized zinc and cadmium.

ADVANTAGES OF "LITHOFORM"

"Lithoform" forms a durable bond for paint. It is economical. It eliminates frequent repainting. It protects both the paint finish and the metal underneath. "Lithoform" meets these Government Finish Specifications:

QQ-P-416
RR-C-82
MIL-E-917A (Ships)
JAN-F-495
AN-F-20
U.S.N. Appendix 6



Photograph by courtesy of Murray Manufacturing Corp.

Murray Circuit Protectors are fully magnetic and provide maximum protection for both domestic and industrial wiring. Housings are of galvanized iron which is Spray Lithorized for long paint life.

THE LITHORIZING PROCESS

"Lithoform" can be applied by brushing or spraying the work with simple hand equipment, by dipping it in tanks, or by spraying it in industrial power washers.

Brush. Galvanized bay windows, cornices, rain gutters, hardware, building siding, truck panels, and farm equipment are typical of the many surfaces that are treated effectively with Brush "Lithoform".

Dip. This grade is used for coating cleaned surfaces of such typical products as cabinets, refrigeration condensers, etc., immersed in heated solutions in tanks.

Spray. The spray process is the most logical one with which to coat sheets, coiled strip or duplicate products best processed on a conveyor.

CHEMICALS ACP PROCESSES WRITE FOR FURTHER INFORMATION ON "LITHOFORM" AND ON YOUR OWN METAL PROTECTION PROBLEMS. CHEMICALS ACP PROCESSES

For additional information Circle No. 40 on the Reader Service Card

cised. The furnaces are made in 200 and 500 lb. cap. (aluminum).

The manufacturer says that the use of a reverberatory furnace effects a great saving in gas consumption over a crucible type because no heat is lost through radiation from the open surface of the metal. Also, the flame in a reverberatory is directed on the metal itself rather than heating a pot which in turn heats the metal.

DCMT Sales Corp.
For more information circle No. 197 on the Reader Service Card.

BRIGHT NICKEL PLATING . . . said to be major plating development

The new bright nickel process called Nickel-Lume, is said to produce better and brighter nickel coatings, to be cheaper to operate and easier to control according to the manufacturer. Both installation and operating costs are lower. Equipment suitable for a Watts nickel bath is all that is required. Ordinary auxiliary equipment may be used, filtration may be either periodic or continuous, ventilation is not required and heat demands are up to 25% lower.

Some of the characteristics claimed for the new bright-nickel process are: bright while color; a well-leveled surface, (this process is said to reduce surface roughness by over 50%); low internal stresses to reduce cracking, crazing and lifting of deposits; good ductility and highly active surfaces. (Baths may be operated at room temperatures up to or even beyond 140F with full deposit brightness. With moderate to high current densities, a temperature beyond 120F is seldom required.

Hanson-Van Winkle-Munning Co.
For more information circle No. 202 on the Reader Service Card.

REFERENCE MATERIAL

Catalogs and data offered free in this month's ads; to receive copies circle number on reader service card.

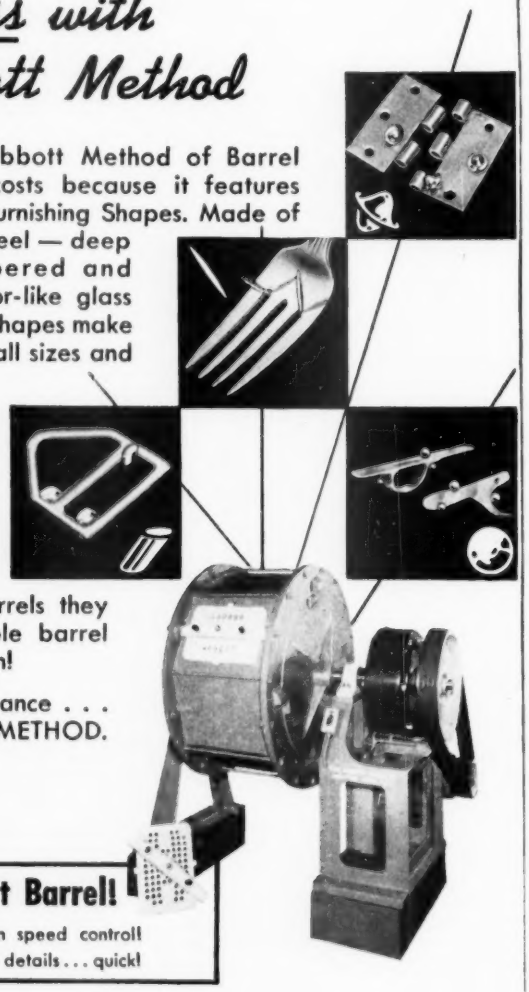
8. WATER . . . THE SAFEST HYDRAULIC FLUID can be successfully used in either central or or individual systems according to literature available from the Aldrich Pump Co.
10. IMPROVED SHELL MOLDING is possible with the proper phenolic binder. The Bakelite Co. booklet gives both the proper binder selection and data on the design and application of shell molded castings.
11. A DIE CASTING MACHINE "Bonus" is described in the complete catalog prepared by Cast-Master, Inc.
13. DIE CASTINGS made by Dollin Corp., and information about the company's facilities, are included in literature offered.
15. THE PRODUCTION AND Research facilities of the Hoover Co. are fully described in the company's booklet "Die Castings".
16. FIRES SELDOM START with hydraulic fluid, but ordinary oils will greatly intensify a fire and increase plant losses. Nonflammable fluid obviates this hazard. An engineering manual, data application book and report of case histories are combined in the E. F. Houghton & Co. publication "Houghto-Safe".
18. ALUMINUM ALLOY SPECS are covered in bulletin 352 from Jobbins.
19. STEADY HOLDING PRESSURES require controlled oil temperatures on die casting machines. Bulletin 1.1K5 from Kewanee-Ross Corp. describes heat-exchangers to do the job.
20. PRESSES FOR POWDER Metallurgy are described and notes on the powder metallurgical process are given in an illustrated catalog published by the Kux Machine Co.
21. SAFER, MORE-RAPID METAL melting and casting with cleaner metal are possible with two-chamber melting furnaces. Bulletin 560 from Lindberg Engineering Co. describes such furnaces.
23. A "FACT-FILE" published by Monarch Aluminum Mfg. Co. describes the Unified Production Formula developed by the company to give a better product at lower cost.
24. NON-FLAMMABLE HYDRAULIC fluids are a safety "must." A complete engineering report on Pydraul F-9 can be secured from Monsanto Chemical Co.
31. POWDER METALLURGY can make a product possible and a good product better. Thompson Products, Inc. has a booklet, MP-532, that tells how.
32. FOR ANY HEAT-TREATING JOB the booklet "Harnessing Heat" will help you pick the right furnace and the right process. It can be secured from Westinghouse Electric Corp.
33. AIR INSTEAD OF MUSCLES will speed production. Bulletin CL-50 from The Bellows Co. describes many of the standard and special applications of air cylinders.
35. APPLICATIONS OF BERYLLIUM copper are fully described and engineering data given in the new Product Directory that is available from the Beryllium Corp.
36. PRE-ALLOYED METAL Powders of chromium-nickel are a new product of Metal Hydrides, Inc. Complete engineering data are available.
38. BASIC DIE CASTING DESIGN Information is in the Newton-New Haven Co. booklet "Designing Die Castings."
39. DESIGN "KNOW-HOW" and superior shop facilities contribute to lower cost dies and molds. An illustrated brochure from Permanent Mold Die Co., Inc. describes their complete facilities.
40. IMPROVED CORROSION RESISTANCE and paint adherance can be secured through the use of Lithoform coatings. Process data, applications, and general information are available from American Chemical Paint Co.
42. IMPROVED FINISHING Operations can be secured through the use of Iridite. Data and informative brochures are available on the methods from Allied Research Products.
43. BARREL FINISHING is the fastest most economical method of finishing small parts that are mass produced. "3M Barrel Finishing" published by Minnesota Mining & Mfg. Co. tells how to apply the method.
48. STANDARD DIE SETS lower the cost of die construction and make die changing faster and less costly. The complete catalog of Detroit Mold Engineering will help you select the best die set for the job.
49. CUT DIE COSTS with standard parts. Data sheet 521 from Detroit Mold Eng. Co. describes their precision ground and hardened ejector pins.
50. SMALL PARTS IN VERY large quantities can be produced on automatic machines as zinc die castings if the maximum weight is ½ oz. or less. The Gries Reproducer Corp. bulletin will be of great interest.
51. ZINC BASE DIE CASTING alloys are listed together with their properties and applications in a booklet from Henning Bros. & Smith, Inc.
53. DESIGNING IN ALUMINUM and Magnesium — Litemetal Dicast, Inc. has literature that will help the engineer design die castings.
54. THE APPLICATION OF PLASTER Mold Castings is described and illustrated in the O. P. C. Job. Study Brochure. Get a copy from Ohio Precision Castings, Inc.
56. DON'T SCRAP WORN OR damaged rotary files, burs, midget mills, etc. Have them reground by Severance. A complete catalag giving the regrinding services available as well as a complete line of new tools can be secured from Severance Tool Industries, Inc.
59. THE ABBOTT METHOD of barrel finishing is covered in literature from Abbott Ball Co.
60. BOTH FINISHING TIME and finishing labor can be reduced through the use of Port-A-Belt grinding attachments, described and illustrated in a folder from The Carborundum Co.

continued next page

REFERENCE MATERIAL — cont.

61. COLOR DECORATION ON Automatic Machines — machines, methods, and materials are fully described in catalogs available from Conforming Matrix Corp.
62. HIGH SPEED LOW COST Plating of small parts and the equipment to do the job are given in the new Daniels Plating Barrel catalog.
63. A WATER WHITE SYNTHETIC finish with a remarkably high degree of corrosion resistance is now available. Technical data on the product can be secured from Maas & Waldstein Co.
64. "HOW TO STRIP PAINT" is the title of a new booklet that has just been issued by the Oakite Products, Inc.
65. TAILORED TO YOUR NEEDS — melting stock for investment casting. A brochure giving the facilities and services of Cannon-Muskegon is now available.
68. SINTERING FURNACES tailored to your specifications do the job better and at lower cost. Information from Harper Electric Furnace Corp. describes the furnaces they make and gives helpful engineering design data.
72. STANDARD SIZES AND SHAPES in bearing and bushings can slice production costs. National Molded Products, Inc. has a listing of available stock sizes to choose from.
75. STAINLESS STEEL LADLES for longer life, greater safety and easier pouring. A catalog of the complete line of these ladles can be secured from Spincraft, Inc.
76. BRIGHT, WEAR RESISTANT Chromium Finishes can be achieved without nickel. Data sheets and engineering information on the Luster-On Zincrome process can be secured from The Chemical Corp.
77. BURRING, SMOOTHING and Polishing operations can be speeded up and costs drastically cut with rubberized abrasives. A catalog of available sizes and shapes of wheels points, etc. is now ready from Cratex Mfg. Co.
78. WHERE DO PERMANENT mold castings fit into your manufacturing picture. An illustrated brochure from Aluminum Permanent Mold Co. will show you.
80. FOR BETTER INVESTMENT Castings at lower cost use a direct-casting electric furnace. A complete line of equipment is listed and illustrated in information available from Detroit Electric Furnace Div. of Kuhlman Electric Co.
81. CUT THE NUMBER OF Rejected Castings with impregnation. The Mogul Cast Seal Impregnating Process will do the job. Full information is available from the Metallizing Co. of America.
82. THE REPUBLIC STORY, an illustrated brochure describing the facilities, personnel and some of the many jobs of Republic Die Casting Co. is now available.
84. LESS DOWN TIME DUE TO Broken Taps can be secured with Procunier Safety Chuck Co. tapping heads. A circular describes them.
86. THE EXPERIENCE AND Facilities for die casting to specifications are described in a brochure from the Racine Die Casting Co.
87. DECREASE FINISHING COSTS, improve results with Almco Supersheen methods and equipment. A 52 page catalog tells how.

Good Barrel Finishing Costs Less with The Abbott Method



It's a fact! The Abbott Method of Barrel Finishing reduces costs because it features long-lived Abbott Burnishing Shapes. Made of selected carbon steel — deep hardened — tempered and polished to a mirror-like glass hard finish, Abbott Shapes make efficient contact on all sizes and designs of stampings and castings. Abbott Burnishing Shapes last longer, burnish more parts and cost less in the long run. Used in Abbott Vertical Barrels they make an unbeatable barrel finishing combination!

For Proven Performance . . . use The ABBOTT METHOD.

Improved Abbott Barrel!

Self-contained! Precision speed control! Color dynamic! Write for details . . . quick!

THE ABBOTT BALL COMPANY
1084 NEW BRITAIN AVE.
HARTFORD 10, CONN., U. S. A.

For additional information Circle No. 59 on the Reader Service Card

ARTIFICIAL LARYNX
continued from page 35

use of investment castings. Due to the thin-walled construction and the required gold and chromium plating, porosity has been an early difficulty to overcome. Elimination of this condition was imperative from a hygienic viewpoint.

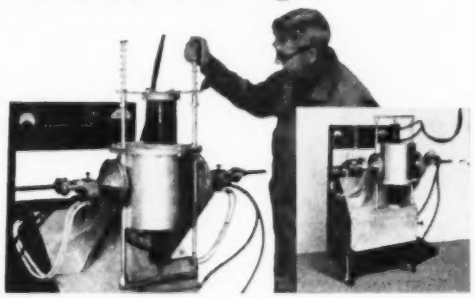
By rigid adherence to precision casting technique and shop practice, the investment casters have been able to hold porosity to a minimum to meet requirements for finish.

These two complex investment castings, although not simple to produce, have transformed an awkward fabricating job into a practical and simple assembly. The optimum alloy chosen for this unit is a silicon bronze which proves to be castable, dense, strong and finishable.

NAMED PLANT MANAGER

A. T. Peters, former assistant plant superintendent, Bay City Division, The Dow Chemical Company, has been named plant manager for the Division according to Hubert Fruehauf, manufacturing manager of Dow's Magnesium Department.

Direct-casting Electric Furnace for better, faster precision investment casting



Melting position *Casting position*

The new, type IC, 12 kw., 10-lb. Detroit Electric Furnace melts and pours heats of chrome-nickel, Stellite or superalloy steels in 9-12 minutes. Casting is done by inverting the furnace, pouring directly into the investment mold which is held in place by air pressure. Melting by fast, controlled, indirect arc minimizes carbon pickup and alloy variation. Simple, efficient operation is ideal for high production of precision castings.

Write for complete information.

DETROIT ELECTRIC FURNACE DIVISION
KUHLMAN ELECTRIC COMPANY
1070 26th St. • BAY CITY, MICHIGAN

Foreign Representatives: in BRAZIL—Equipamentos Industrias, "Eisa" Ltd., Sao Paulo, CHILE, ARGENTINA, PERU and VENEZUELA: M. Castellvi Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Cia Proveedora de Industrias, Atenas 32-13, Apartado 27A3, Mexico 6, D. F., Mexico; EUROPE, ENGLAND: Birlec, Ltd., Birmingham.

Circle No. 80 on the Reader Service Card

NOW! YOU CAN GET IMMEDIATE DELIVERY

on The *FINEST* EJECTOR PINS Made!

DME **HOTFORM and NITRALLOY EJECTOR PINS**

CHECK THESE FEATURES!

HOT-FORGED HEAD for Added Strength

NITRIDED CASE for Longer Wear

ANNEALED HEAD that CAN BE DRILLED

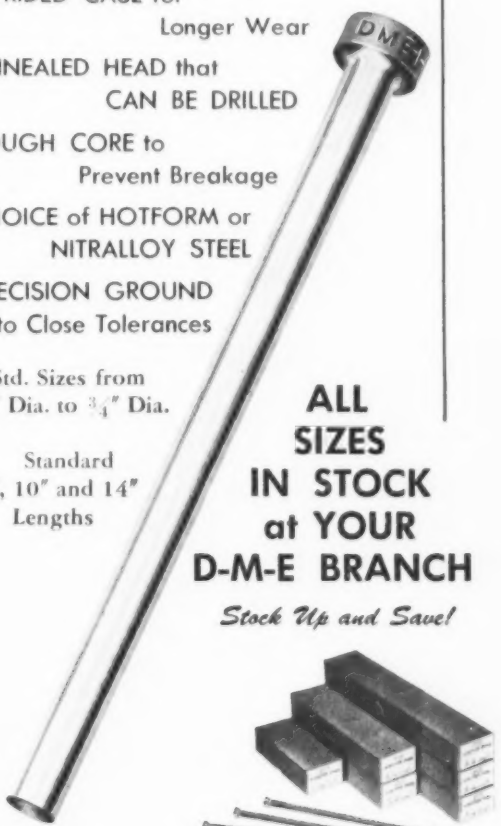
TOUGH CORE to Prevent Breakage

CHOICE of HOTFORM or NITRALLOY STEEL

PRECISION GROUND to Close Tolerances

Std. Sizes from $\frac{3}{32}$" Dia. to $\frac{3}{4}$" Dia.

Standard 6", 10" and 14" Lengths



ALL SIZES IN STOCK at YOUR D-M-E BRANCH

Stock Up and Save!

Consult your D-M-E Catalog for Data and Prices, . . . OR WRITE TODAY for DATA SHEET 521.

Contact Your Nearest Branch FOR FASTER DELIVERIES!

DME **DETROIT MOLD ENG. CO.**
6686 E. McNICHOLS ROAD — DETROIT 12, MICH.

HILLSIDE, N. J.	1217 CENTRAL AVE.	ELIZABETH 3-5840
CHICAGO 44, ILL.	5315 W. LAKE STREET	COLUMBUS 1-7055
CLEVELAND 14, OHIO	5473 LAKE CT.	ENDICOTT 1-0007
LOS ANGELES 7, CAL.	3700 SOUTH MAIN ST.	ADAMS 3-8214

Circle No. 49 on the Reader Service Card

For additional information Circle No. 79 on the Reader Service Card

IMS CONCENTRATED

SILICONE

BOMB

MOLD LUBE

The Best Mold Release You Can Buy! Forms a "Slick Quick"!

UNDILUTED
ODORLESS
NON-TOXIC
SAFE

Dry Freon Propellent Protects Your Molds

PRICES:

Sample Can .. $ 2.00
Unbroken Dozen $18.00
(at $1.50 each)
Unbroken Gross $197.40
(at $1.37 each)

Further discounts on larger orders

INJECTION MOLDERS SUPPLY CO.
3514 LEE ROAD WYoming 1-1424 CLEVELAND 20, OHIO

USEFUL LITERATURE
continued from page 68

Die Casting Machine Piston Rings 170
Announcing a complete range of sizes in both hardened steel and cast iron piston rings, Auto-Diesel Piston Ring Co. has just published a new and revised listing giving both available sizes and prices.

Industrial Filtration Equipment 171
Automatic, self cleaning, compact industrial filters adaptable to a wide variety of industrial applications are described in a leaflet from the manufacturer, Murray-Way Corp.

Belt Grinding & Finishing 172
The advantages of grinding and finishing with abrasive belts is described in a bulletin from Minnesota Mining & Mfg. Co. A variety of different applications of abrasive belts are described and illustrated.

Water Filters 173
With no basic changes in their synclinal design, Marvel Engineering Co. has adapted all of their sump and line type filters for use on water lines. Descriptions and engineering data on these filters is in a new catalog issude by the company.

$2.00 Saving on Compressor Valve Bodies with Ohio Precision Castings

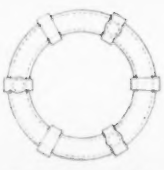
Gordon Smith & Company, Bowling Green, Ky., air compressor manufacturer, formerly used sand castings for valve bodies and other parts of its Model 105-S Compressor. This required machining of the small ports and slots on a vertical milling machine.

Now, with O. P. C. plaster mold castings in manganese bronze, these slots and ports are cast. Only slight finishing is necessary on these castings — thus saving over $2.00 per valve body, with similar savings on intake bumper and discharge bumper castings.

In like manner, O. P. C. craftsmen, with their vast skill and accumulated experience, are ready to help you save time and money on your production, assembly or experimental work by the use of Ohio Precision Castings.

Write today for your copy of O. P. C. Job Study Brochure on precision casting applications—no obligation!

O. P. C. castings for Gordon Smith Compressor, Left: Intake Bumper, Right: Exhaust Bumper.



Above Gordon Smith Compressor valve body, an O. P. C. casting.

OPC

OHIO PRECISION CASTINGS, INC.
P. O. Box 55, Station "A" • • DAYTON 3, OHIO
Plaster Mold Castings made from
BRASS • BRONZE • ALUMINUM • BERYLLIUM COPPER

For additional information Circle No. 54 on the Reader Service Card

Heavy Duty Cleaning 174

A new line of detergents specifically designed for heavy duty have been announced by Oakite Products, Inc. A description of the new detergents together with engineering application data is published in leaflets.

Degreasers & Washers 175

A complete line of vapor degreasers and metal washers is given in two new booklets that have been published by the G. S. Blakeslee & Co.

Zinc Die Casting Cleaner 176

Designed specifically for cleaning zinc base die castings, a new line of cleaners is described in free data sheets issued by MacDermid, Inc.

Phosphate Coatings 177

Chemicals and processes for securing a phosphate coating on metals is described in a booklet from American Chemical Paint Co.

The Parkerizer 178

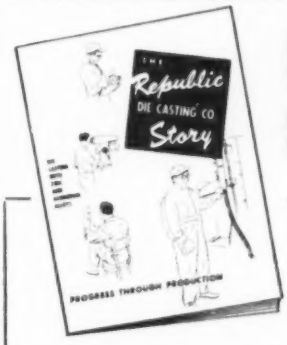
A house organ of the Parker Rust Proof Co. gives applications and technical data on rust proofing of metal products.

Color Filling Machine 179

Filling depressed lettering and designs on metal products is discussed in the reprint of an article available from the Acromark Co. Included are leaflets describing the companies various machines for doing the filling.

continued next page

For additional information Circle No. 82 on the Reader Service Card



LET US SHOW YOU

We'll be glad to send you free this descriptive brochure telling all about Republic Die Casting Company . . . . our facilities, our people, and some of the thousands of die castings we are now producing. Drop us a note and your copy will be sent promptly.

Before you place your orders for die castings, or even before you ask for quotations, you will want to know something about the company with which you are dealing. You need to know that it has the up-to-date facilities and the skilled personnel to produce castings to your specifications. You will probably also want to look at some of the castings we now produce. That is why we have prepared this informative piece of literature for your reference.

Die castings in zinc and aluminum

REPUBLIC DIE CASTING COMPANY

611 Talcott Avenue St. Louis 7, Mo.

YOU be the Judge of HENNING ZAMAK (Zinc Base) DIE CASTING ALLOYS

Yes sir, you make the decision whether "H. B. & S." ZAMAK provides greater satisfaction than any product you ever used.

We are confident that our alloys leave nothing to be desired. A trial will convince you of their merit and dependability. Specify HENNING and be sure!

Are you receiving our monthly house organ THE HENNING MESSENGER? We think you would enjoy it. Return coupon below to be put on the mailing list and also obtain booklet covering all ZINC BASE ALLOYS.

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City ..... State .....

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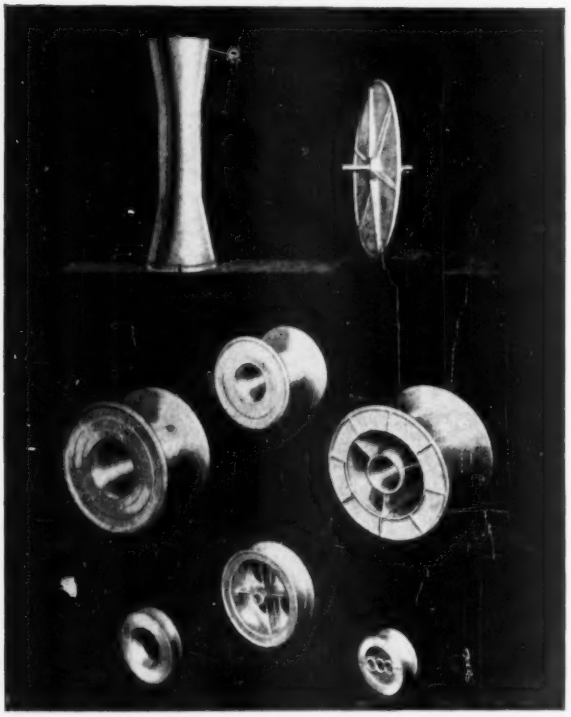
Die Cast

ALUMINUM and MAGNESIUM SPOOLS and BOBBINS for SHIPPING and PROCESSING WIRE and TEXTILES



Industrial uses and applications of parts manufactured from die cast aluminum and magnesium are almost limitless. These new light weight alloys offer through the die casting process great savings in time, materials and much of the labor otherwise required for machining and finishing. In addition, the savings in weight often effect reductions of shipping costs.

Illustrated here are some of the spools and bobbins die cast by LITEMETAL in single units from aluminum and magnesium. Our extensive experience in the production of these spools and bobbins has proved their efficiency and economy for the processing and shipping of wire and textiles.

Let's Talk It Over . . .

LITEMETAL DICAST, INC. is an organization of specialists — men thoroughly experienced in the casting and machining of magnesium and aluminum alloys. Our equipment includes big machines for big jobs — little machines for little jobs . . . the right sizes and types of the most modern die casting equipment for producing parts from the size of a button to large cable spools. Complete facilities for secondary operations are also available.

Write today for literature and design information. Quick action on inquiries.

LITEMETAL DICAST, Inc.

A DIVISION OF HAYES INDUSTRIES

1925 WILDWOOD AVE. · JACKSON, MICHIGAN

PLANT AND EXECUTIVE OFFICES

Circle No. 53 on the Reader Service Card

USEFUL LITERATURE — cont.

Radiant Heaters 180

Fused quartz radiant heaters for drying, baking and other applications are described in a 4 page brochure from Cleveland Process Co.

Blast Cleaning 181

In a 32 page booklet No. 1500, the Pangborn Co. describes blast cleaning, gives much technical information and many suggested uses.

Vapor Degreasing Manual 182

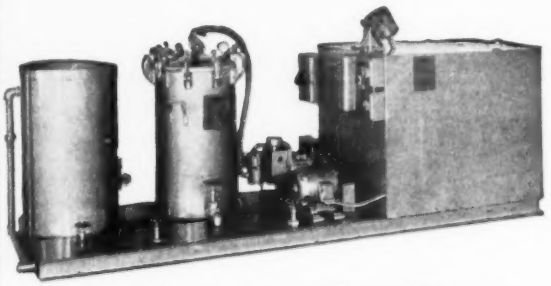
A comprehensive 34 page manual on vapor degreasing has been compiled by Circo Equipment Co. The manual covers practically every phase of vapor degreasing and is fully illustrated with diagrams and cutaway photographs.

Silicone Parting Lubes for Shell Molding 183

A new 8-page brochure from Linde Air Products offers full technical data about three of their silicone lubricants specifically designed as parting agents to be used in shell mold castings.

Permanent Mold Casting Alloy 184

From American Alloys Corp. has been received a new data brochure on their Amalloy aluminum-magnesium-titanium casting alloy. It is suitable for permanent mold and sand casting. Physical, chemical and casting characteristics are given.



A Packaged Impregnating Plant

THE MOGULLIZING VACUUM PRESSURE-UNIT

Model M-30

For low-cost, efficient impregnating of porous and leaking pressure castings, either ferrous or non-ferrous metals, use our MOGULLIZING Vacuum-Pressure System. The MOGULLIZER is made in all sizes from the small laboratory models of one cubic foot to the large industrial units with 100 cubic feet or more auto-claves (impregnating tanks). We obtain 29.5" or more of vacuum with this machine.

MOGUL Cast Seal is recommended with these units for impregnating all types of castings. No after-baking required.

Send us your problem and ask for booklet: "Mogul Cast Seal Impregnating Process"

METALLIZING COMPANY OF AMERICA

Dept. PMM

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INDUSTRY NEWS

DU-WEL EXPANSION CELEBRATED THIS MONTH BY OPEN HOUSE

A formal open house ceremony on Saturday, December 5, marks the completion of an expansion program by Du-Wel Metal Products, Inc., of Bangor, Mich.

The expansion brings approximately 14,000 square feet of additional floor space to the company which manufactures die castings in zinc and aluminum alloys.

Announcement has also been made by Ted Bator, president of Du-Wel that Louis E. Capek has joined the company as plant superintendent. Mr. Capek was factory manager at Security Locknut Corp. in Chicago for two years prior to joining Du-Wel and was, for the preceding eight years, chief inspector with the Stewart Die Casting Div. of Stewart Warner Corp.

The company, organized in 1946, has increased its labor force since then from 32 to about 150 employes, has increased its floor space from about 50,000 to 80,000 square feet, and has shown an increase in annual sales volume of about 600 percent.

INVESTMENT CASTING GROUP APPOINTS SECRETARY

The Investment Casting Institute, formally organized last June, has appointed Harry P. Dolan, of Chicago, Ill. as executive secretary. Mr. Dolan will, for the present, devote only a part of his time to ICI duties.

With the appointment of an executive secretary, the active work of the Institute will get under way. Membership in the Institute is open to all companies actively engaged in the manufacture of parts by the investment casting process, as full members, and companies associated with the industry as affiliate members.

Further information concerning membership and the aims and objectives of the Institute can be obtained from either K. M. Bartlett or M. Hitchcock, both of Thompson Products, Inc. 23555 Euclid Ave., Cleveland, Ohio.

A. MILNE EXPANDS CHICAGO FACILITIES

A. Milne & Co., distributors of solid and hollow tool steels announce that they have moved their Chicago office and warehouse to larger facilities in a new, modern building constructed by the company at 2080 N. Hawthorne Ave., Melrose Park, Ill.

Designed to permit the simultaneous loading of two full trailer trucks entirely within doors, the new building has approximately 12,000 square feet of floor area. Included in this area is ample, modern office space for Milne's Chicago sales staff.

The new building will be used to house the stock of carbon and oil hardening tool steels; high chrome, high carbon steels; hollow die steels in water hardening, air hardening, and graphic grades. Other special tool and die steels normally stocked by the company will also be carried at the new warehouse.

CLEVELAND HARDWARE NAMES SALES HEAD

Lewis D. Fykse

According to an announcement by Robert E. White, president of The Cleveland Hardware and Forging Co., Lewis D. Fykse has been named vice-president in charge of sales. Fykse will direct sales for the company's forging, die casting, and truck and body hardware divisions.

METALS DISINTEGRATING IS HOST TO METALLURGIST

A group of 15 leading powder metallurgists from various European countries are presently visiting plants in the United States to learn techniques and equipment used here. Recently this group visited the Metals Disintegrating Co. plant in Elizabeth, N. J. to learn how this company prepares metal powders for both metallurgical and pigment uses.

The purpose of the visits is to help the European manu-

continued next page

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Improve Your INVESTMENT CASTING Results!

Get accurate castings *every time* . . . with Ransom & Randolph Investments! 50 years of leadership in dental casting investments . . . 12 years in industrial field . . . the *right* investment to save time and money for you . . . all low and high-melting alloys.

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Let us help you solve your investment casting problems.

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THE RANSOM & RANDOLPH CO.
TOLEDO 1, OHIO
Established 1872 • Known the world over for products of highest quality

Precision Made . . . For Precision Performance

POWDERED METAL PARTS

precision made from exclusively formulated non-ferrous Sintroloy and Ductiloy are molded to close tolerances, thereby eliminating machining of intricate shape and high scrap loss.

Perhaps we may be able to help you solve specific parts problems. Get in touch with National Molded today for prompt attention.

Write today for detailed information and free literature on cost-saving standard bearings which are available from stock.

NATIONAL MOLDED PRODUCTS, INC.
1942 MILL ST. • ST. MARYS, PA.

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facturers bring their plants up-to-date so that they are not dependent upon American help and financial support.

U. S. manufacturers have more rapidly developed newer techniques in handling of metals, and set the pace for broader applications of powder metallurgy, not only for bearings and structural parts, but also in production techniques of the metal powders.

Currently four groups are touring the U. S. plants. Their specific fields of interest include:

1. Electrical and magnetic materials.
2. Hard metals, tungsten powder, single and mixed carbides.
3. Refractory materials; high temperature material and semi-rare metals such as titanium, beryllium, etc.
4. Engineering components and metal powders.

NON-BERYLLIUM ALLOYS MADE BY BERYLLIUM CORP.

For the first time, the Beryllium Corp. of Reading, Pa. is manufacturing alloys that contain no beryllium.

These alloys are zirconium magnesium, manganese aluminum, and titanium manganese aluminum. All alloys are being produced strictly on a trial or market-testing basis to see whether the demand for any or all of these materials is enough to warrant going into production on a commercial scale.

All three alloys are so-called master alloy types and are for the expressed purpose of introducing the alloying material into melts.

Production of these non-beryllium alloys on a commercial scale would not involve major overhauling of present methods and facilities.

NEW HIGH SPEED X-RAY TECHNIQUE BEING TRIED

Known as Xeroradiography (pronounced "Zero Radio-

graphy") a new technique involving a dry plate and requiring no dark room development is being tried-out by the Aluminum Co. of America for inspection of castings.

Conventional x-ray equipment is used through out except for the plate. Static electricity arranges a fine grain powder on a specially coated aluminum plate and produces an image similar to that on an x-ray film.

The image is ready for viewing within 45 seconds as compared with about one hour required to develop and dry a conventional film. No dark room facilities are required.

Where a permanent record is desired the Xeroradiographic plate can be photographed in the conventional manner.

One advantage that is envisioned for the new inspection method is the installation of X-ray inspection equipment on a continuous production line.

ASTM ISSUES REPRINT OF COMMITTEE ACTIVITIES

A reprint of committee activities in research, originally published in the December 1952 and January and February 1953, is now available from the society headquarters.

Included in the reports are the current work of Committee B-6 on die casting and Committee B-9 on powder metallurgy.

Copies of the pamphlet are available without charge at ASTM headquarters, 1916 Race St. Philadelphia 3, Pa.

FURNACE DIVISION INCORPORATED

The furnace division of R-S Products Corporation announces its incorporation, and will be known in the future as R-S Furnace Corp., a subsidiary of Hardinge Co., Inc.

The new corporation will have D. E. Wyman as vice president, S. M. Stoler as assistant to the vice president, and F. L. Feldmeth as chief engineer.

The company will continue as specialists in custom built, field erected billet heating, forging and heat treating furnaces for both ferrous and non-ferrous metals.

REYNOLDS APPOINTS DISTRIBUTORS

Announcement has been made of the appointment of two new distributors of Reynolds aluminum. The new affiliates, Pennsylvania Industrial Supplies Co., Inc., and Ontario Metal Supply Co., Inc., will warehouse and sell specialty aluminum wire, rod and

Compare
PARAGON'S
PERFORMANCE
with others when you need
ALUMINUM and ZINC BASE
DIE CASTINGS
For superior design, better appearance and greater strength . . . select PARAGON Die Castings. They are everything the name implies.
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For additional information Circle No. 55 on the Reader Service Card

bar (screw machine stock) products.

The two distributors are equipped to provide prompt service and technical assistance on the products, and will maintain an adequate inventory of all standard alloys and sizes to provide greater availability for these products in the Pittsburgh and Rochester areas.

NEW, RAPID DRYING PROCESS DEVELOPED FOR PAINT, INK

A radically new technique for the rapid drying of protective and decorative coatings of inks, paints, and varnishes has been developed by Armour Research Foundation of Illinois Institute of Technology. The research project was undertaken for the Meyercord Co. of Chicago.

The new Chemdry process is said to shorten drying time on coated products from 24 hours to between 2 and 20 seconds. Drying is accomplished by chemical reaction between the coating and sulfur dichloride vapor instead of by commonly accepted polymerization or oxidation. Meyercord intends to make the process available to industry.

here's how BIG INDUSTRIES SAVE on SMALL PARTS

GRIES DIE CASTINGS CAN SOLVE YOUR SMALL PARTS PROBLEMS TOO — IN ONE OPERATION!

GRC zinc alloy die castings open extraordinary possibilities for new designs, products and economies, by producing the most intricate tiny parts in one high-speed operation. Gries offers fast delivery of 100,000 pieces to many millions on completely finished small parts. Write today for bulletin and samples—GRC may already have your problem solved or can solve it quickly and economically. Send prints for quotations.

America's Foremost Producers of Tiny Die Castings.

SMALLNESS UNLIMITED
Max. Wt. ½ oz.
Max. Lgth. 1¾"

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METALS DISINTEGRATING CO. PROMOTES TWO

H. E. Hall, president of Metals Disintegrating Co., Elizabeth, N. J., has announced two promotions. George H. Tulley has been appointed sales manager of powdered metals and will headquarter in the company's Cleveland office. Julius Sachse, previously vice president and works manager of the company's Elizabeth, N. J., plant, has been appointed vice president in charge of research and development.

George H. Tulley

Julius Sachse

Mr. Tulley has more than 18 years experience in the powdered metal field. Mr. Sachse, who has been associated with Metals Disintegrating since 1941, will carry out his duties in expanding the development of commercial applications of powder metallurgy.

PROMOTIONS AND APPOINTMENTS

An announcement from *Acheson Colloids Co.* notes the appointment of O. W. MENDENHALL as service engineer with headquarters in Milwaukee, Wis.

FRANK H. ADAMS, president of *Surface Combustion Corp.* was given the distinguished service award of the Gas Appliance Manufacturers' Association for his achievements as a "pioneer" in the development of gas as a tool now employed in more than 26,000 industrial processes."

SIPI Metals Corp., Chicago, announces the appointment of IRWIN GOODMAN as assistant treasurer of the corporation.

Engineer for Acheson

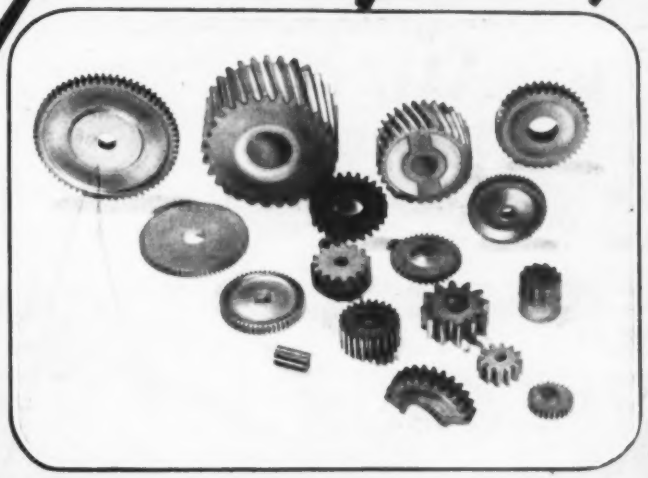
O. W. Mendenhall

Vanadium-Alloys Steel Co., Latrobe, Pa., has announced the election of DR. GEORGE A. ROBERTS to the post of vice-president in charge of technology. Dr. Roberts, formerly chief metallurgist for the company was named vice-president at a board of directors meeting Oct. 27th.

Yale & Towne Mfg. Co. has announced the appointment of ROBERT M. WHITNEY as manager of national advertising and promotion. Whitney, formerly sales manager of the Automatic Transportation Div. of the company has been with Yale & Towne since 1936 in both sales and service departments. Since 1945 he has directed the advertising for the Automatic Transportation Div. Mr. Whitney will make his headquarters in New York.

WILLIAM H. MURPHY has been appointed district man-

Geared to Variety



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Originators of

SINTERED HELICAL GEARS

in Brass, Bronze, Steel

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MERRIMAN BROTHERS, INC.

185 Amory St., Boston 30, Mass.

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DESIGN FOR THE ULTIMATE IN DIE CASTING

NE

We offer every customer competent engineering assistance in product design. This service assures you lowest tooling cost, flexibility of production . . . highest quality at lowest cost.

THE NEW ENGLAND DIE CASTING CO.

445 Front Avenue West Haven, Conn.

Spincraft
SKILL WILL DO IT
stainless steel
Ladles...
for die casting
give you these advantages

- easier pouring
- increased output
- longer service life
- increased safety

Because Spincraft ladles of stainless steel are so much lighter in weight, because they are so resistant to high temperatures, because they so positively lower costs in all directions, they are now in use in over 200 die casting plants everywhere—including the country's leading producers. Write today for an informative bulletin illustrating Spincraft's wide range of ladle sizes.

Spincraft
INCORPORATED

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Milwaukee 8, Wis.

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ager of the Metal Industries Dept. of *The Diversey Corp.* He will supervise the sales of pre-finishing cleaners and etchers in Illinois, Wisconsin and Missouri.

ROBERT T. GREINER has been appointed district sales representative of the manufacturing division of *Aluminum Industries, Inc.* for the states of Ohio, Kentucky and Southern Indiana, according to an announcement by ROBERT E. HATER, director of sales.

The new sales representative for the *Ajax Engineering Corp.* in the New England territory will be JOSEPH M. HALLORAN, of Hamden, Conn., who will handle the company's line of low frequency induction furnaces in the New England territory.

The J. C. Miller Co. of Grand Rapids, Mich. announces the recent appointment of ROGER I. SLATER as sales representative in the Southern Ohio area. He will headquarter in Cincinnati.

JOHN T. TEBBEN, vice president in charge of sales for *Wagner Brothers, Inc.* has announced the appointment of HARRY HARITON as sales representative in New York City, Long Island and Northeastern New Jersey.

PHILIP C. MUCCILLI has been appointed production manager of *National Lead Company* succeeding E. R. ROWLEY, who becomes president of Titanium Metals Corp. of America, a subsidiary of National Lead and Allegheny Ludlum Steel Corp.

As part of their expansion program, *Picco, Inc.* recently announced the appointment of ROBERT D. REMINGTON to the position of division manager of their sintered metal parts division.

OPPORTUNITIES

ENGINEERING SERVICE:—We will design your dies for powdered metal parts. Rates reasonable-prompt service. Send part prints for quotation. W & K Design Service, P. O. Box 146, Plymouth, Michigan.

DIE CASTING ENGINEER

Experienced in the die casting process, who can design dies and set up processes for production.

Real opportunity for capable and aggressive man.

Outline education, experience and salary requirements.

Location, Eastern Michigan-near Detroit.

Write to BOX NO. 12253,

Precision Metal Molding magazine.

WANTED
BY SUBSTANTIAL
NEW YORK COMPANY
MAGNESIUM SAND-CASTING EXPERT

Must be able to set-up and develop a magnesium sand-casting foundry including selection of equipment, operating manufacturing dept. and technical development.

Write in detail, state salary desired.

Write to BOX NO. 12153

Precision Metal Molding magazine

SALES ENGINEER WANTED:—Must have degree in metallurgy, chemistry or mechanical engineering or equivalent in sales experience. To sell complete line of metal powders. Locate Cleveland, Toledo or Detroit. Salary basis plus liberal pension plan, insurance and hospitalization benefits. Reply Box 12353, Precision Metal Molding magazine.

ESTABLISHED DIE CASTING account desired by successful engineer in Philadelphia area. Experienced in die casting sales and estimating. Write Box 12453, Precision Metal Molding magazine.

ALUMINUM RESEARCH INSTITUTE CHANGES NAME

According to an announcement from C. V. Cooper, president of the Aluminum Research Institute, the name of the association has been changed to Aluminum Smelters Research Institute.

The purpose of the change is to indicate more clearly the scope of the organization, which for 24 years has been the trade association of the aluminum smelting industry. There will be no change in the organizational set-up or in the objectives of the association, which have always been the improvement of aluminum casting alloys and the advancement of the aluminum smelting industry.

Officers of the Institute are C. V. Cooper, of Wm. F. Jobbins, Inc., Aurora, Ill., president; A. E. Bergman, U. S. Reduction Co., E. Chicago, Ind., vice-president; Allan Nichamin, Federated Metals Div., Detroit, Mich., treasurer; Carl H. Burton, secretary. Headquarters remain at 20 North Wacker Drive, Chicago.

"Take it with a grain of salt"..
We're all inclined to boast about the quality and superiority of our products. And those who hear or read our claims, naturally discount them accordingly. That's why we at Badger prefer to let the records speak for us—records which show that many leading manufacturers of household utensils have had Badger die cast their products for over 33 years.
Consult Badger on all your die casting problems.
BADGER
DIE CASTING CORP.
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MAGNESIUM
continued from page 38

producing to military specifications, you wouldn't expect to find much commercial work around.

"We have been living with magnesium so long that I do believe that many of us are not entirely aware that most people — commercial application design engineers and the public — have little understanding of magnesium. In fact, a large part of the public has a hard time identifying magnesium as a metal.

"It may seem far fetched to believe that commercial manufacturers and their design staffs have little real knowledge about the characteristics of magnesium. But I personally believe this to be true. I certainly know the public, in the main, can't even recognize the word magnesium.

"Many commercial manufacturers are vaguely aware of the existence of magnesium. And, of course, the public, which is the manufacturer's market and which influences his choice of materials and design decisions often enough, has but a scrap of information about the very thing we wish to sell.

"This situation is inconsistent with a thriving industry expecting to hold a position of importance in our economy. Our main claim to any importance now rests almost entirely on the essential character of our industry in our country's defense.

"We have, I'm afraid, all been a little too complacent. We have also been too inclined to accept our high magnesium production figures as a future barometer of our success.

INVESTMENT CASTINGS FINISHED TO PRINT

•

With one order you can buy Hitchiner precision investment castings and have them delivered to you machined to print by Hitchiner Products Corp.

You get 100% good parts ready for the assembly line — there are no spoiled castings in machining, relieving you of many headaches and hidden costs.

Hitchiner Products Corp. assumes full responsibility for the finished component.

In addition Hitchiner Products Corporation is in a position to supply small sub-assemblies in connection with Hitchiner Precision Investment Castings.

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Representatives in Principal Cities

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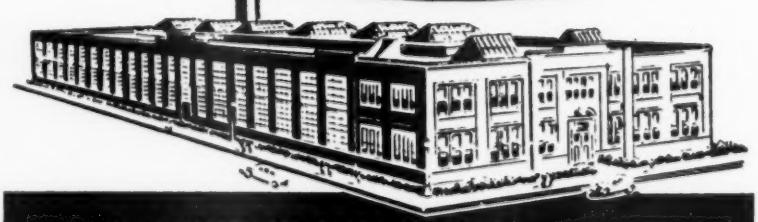
From One Source



A COMPLETE DIE CASTING SERVICE
. . . FROM DESIGN TO FINISHED PRODUCT.

No matter what your die casting requirements may be, Central has the facilities, the equipment, the experience and trained personnel to produce castings to meet your rigid specifications.

Take advantage of Central's complete facilities and be assured of prompt economical service on the best castings made.

- Complete engineering and design service
- Die and tool making
- Most modern production equipment
- Research and quality control facilities
- Machining and finishing

May we help you with your production requirements.

Write today for prompt and practical assistance.

CENTRAL Die Casting & Mfg. Co.
2935 W. 47th Street • Chicago 32, Illinois

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"Is magnesium held up in its advance into the commercial market exclusively because of price? - - or is it because we have not really explored new markets? - - or because we have ignored research into basic developments and alloy methods?

"Commercial design engineers just don't know magnesium, and I wish I had a survey to prove it. The design engineer of today can't keep up with the technical developments that are taking place.

"New, eager-to-learn engineers are coming out of schools. More exprienced but also young engineers are moving up the ladder to eventual influence. So, any industry, new or old, can hardly afford to relax in its educational efforts. Certainly, no industry that wishes to remain strong can afford to wish, want and wait, which so far is the magnesium industry's peculiar heritage of the past.

"In this country, many people assume a revolution has taken place in magnesium foundry techniques and not in iron foundries. The quality of magnesium castings should be sky-high with the price remaining somewhere around sea level.

"If we send a magnesium casting out in the same rough condition (as an iron casting), it bounces back to us like a rubber ball. People expect more quality from magnesium than any other alloy I know, another area in which, from the foundry man's standpoint if no other, a little education would help.

"At the present time, the number of potential magnesium applications in the commercial market is apparently limited. Regardless of how apparently limited or fixed - - whether by magnesium's price or lack of knowledge - - the fact still remains that too few have been forced to examine magnesium."

STAINLESS STEEL PATENTED FOR POWDER METALLURGY AND INVESTMENT CASTING

A very broad U. S. Patent, No. 2,633,420, has recently been granted to Karl Spitz, vice-president of Uniworld Research Corp. of America, for a new group of steel alloys called Super Rustfree Steels.

Compared to standard stainless steels, SR steels are reported to show greatly improved corrosion resistance, heat resistance, tensile and yield strengths at room and elevated temperatures and are, and remain, austenitic even after severe cold working.

Present production is limited to minus 100 mesh powder for powder metallurgical uses and pellets for remelting in the investment casting industry.

DIE CASTERS! DIE MAKERS!

SAVE on Die Construction Time!

With D-M-E STANDARD

DIE CAST DIE ASSEMBLIES!

Using D-M-E

STANDARD CAVITY RETAINER SETS and EJECTOR BOXES

D-M-E Cavity Retainer Sets are of high quality Alloy Steel and are precision ground, flat and square. Std. plate sizes are from 7/8" to 5 7/8" thick and are aligned with sturdy, precision-built leader pins and bushings.

D-M-E Standard Ejector Boxes are of light-weight, welded steel construction. Std. sizes carried In Stock from 12" x 12" to 18" x 29½". When you specify D-M-E Standards, you get . . .

The Perfect Combination For Quality Die Casting

You'll SAVE TIME and MONEY with D-M-E STANDARDS!

Write TODAY for Catalog giving complete Specifications and Prices . . . !

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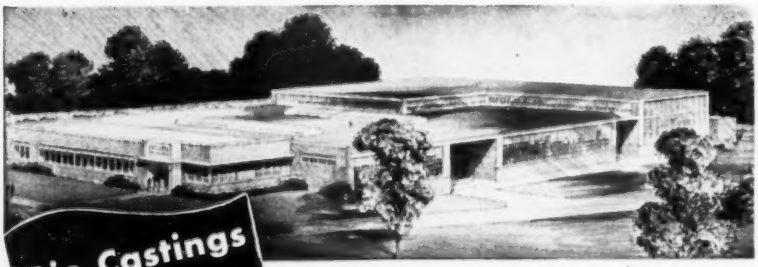
MASTERMET

CANNON MUSKEGON
Muskegon, Michigan, U.S.A.
Tailor Made Alloys for the Investment Casting Industry

FREE ROLLING CASTERS
continued from page 33

These casters are presently being manufactured in only one size, with 2½ inch diameter (without rubber tire). They are designed to support 100 pounds per caster.

The smooth, quiet operation is due, in part, to the exceptional length of bearing surfaces. The steel shafts ride inside long bearings, which are carefully machined for accurate fit with proper tolerance. The holes for bearings are cored, and are subsequently machined to remove the taper and give proper fit. These operations, plus the drilling of the holes for the drive pin, are the only machining required.



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We operate under the Certified Zinc Plan of the American Die Casting Institute, Inc.

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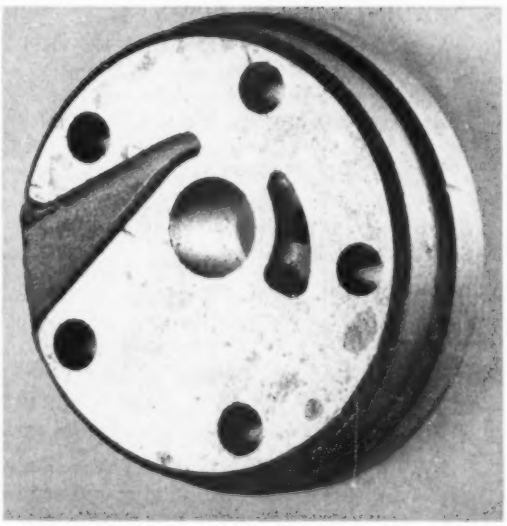
SIMPLIFIED SOLUTIONS

for production problems

DESIGNED as an investment casting, the lens mount illustrated at the right has saved several hours of machine time, as well as 70 percent metal loss. It is cast in 303 stainless steel by Jelrus Precision Casting Corp. for a manufacturer of aerial cameras.

Weight of the casting is about one pound. Tolerances of ± .015 are maintained on diameters of more than four inches. Out-of-roundness is held to a total of .015 on 4¾ inch diameter.

This piece, which is somewhat larger than the average for investment cast pieces, represents typical reductions on machining operations and chip loss.



ONE OF THE MAJOR aims of powder metallurgy in the industrial scheme is to reduce complex machining jobs to simple powder fabricating procedures. This is particularly true when it is possible to convert a part that was formerly an iron casting on which considerable machining had to be done.

For example, the oil burner port housing illustrated, left, was originally such a casting. While the only machine operation that has been eliminated by conversion to a powdered metal part is milling, all of the other operations have been so greatly reduced that the net result of the conversion is a very material decrease in the cost of the finished part.

Pressed and sintered by Metal Powder Products Co. the port housing is furnished as a finished piece except for drilling and bearingizing the center hole, drilling the angular holes and surface grinding to hold a total thickness tolerance of 0.0003.

FRICTION MEMBERS
continued from page 37

but again the economics of manufacture preclude them even if the desired coefficient of friction could be secured, and it can not be.

Weight control is another problem which militates against any method of production other than powder metallurgy. For proper functioning the weight must be held to ± 0.05 grams, an almost impossible task using standard machining practice or the more precise casting methods.

On the same model typewriter where the carriage return is motor driven there is a considerable shock load at the start of the return movement. If a motor were installed with sufficient torque to handle this initial load it would be uneconomically large. Further, should a jam occur in the machine such a large motor could cause considerable damage befort it would stall; if it did stall, it might burn out before the operator could turn off the power.

To provide protection for both the motor and the machine some sort of a clutch must be installed between the primary drive and the first reduction gearing. Such a clutch is shown in Figure 4 and uses as a clutch facing a special sintered copper friction material manufactured by the Raybestos-Manhattan Corp.

In operation, the clutch must slip when the starting load is higher than the safe torque developed by the motor. Thus when any over-load from any cause occurs the clutch will slip before damage can be done to the machine or the motor burned out.

The molded friction material is mounted on a steel backing plate with two rivets and pressure applied to maintain contact between the facing material and the housing, which acts as the other part of the clutch, by a spring. The pressure on one spring is variable to allow for any desired amount of slippage as well as to take up for wear.

The unique ability of powder metallurgy to make complex mixtures of metals or metals and non-metals to give almost any desired coefficient of friction is reason enough for its use in this application.

A second reason for its use is that the rate of wear is considerably less than any of the more common non-metallic friction materials so that replacement of the clutch face will, in ordinary use, never be necessary.

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SHROUDED BUSHING
continued from page 46

a tight surface covering. This shroud can then be plated or otherwise finished in the same manner as the balance of the hinge.

If, as may be the case, the hinge body is iron, stainless steel, aluminum or some similar metal, it is only necessary to change the material from which the cup is fabricated to have the exposed surfaces of the bushings match the hinge material.

The usual procedure for plating is to mount a number of bushings on a rod and draw them tightly together with a clamping nut. To be sure that no cleaning or plating solution gets at the porous bushing requires that the two faces be flat and parallel and exactly at right angles to the bore.

Other rather special requirements that this shielding process require are unusually close tolerances on thickness and on the depth of the shoulder. OD of the bushing is also critical if it is to be a snug fit in the drawn cup. In view of the special requirements the usual bushing specifications may not apply. For this particular application the fabricator is holding these tolerances:

Bore	0.0015 total
Overall OD	±0.002
Shoulders .	0.002 total
Thickness .	±0.002

The finishing operations after the bushings have been mounted on an arbor are quite standard, depending upon the type of final finish to be achieved. If chromium plated (or any other type of electrodeposited or anodized finish) a standard procedure is followed. For burnished brass or bronze the parts are hand buffed using a lime coloring. Where a plain steel finish is used, the parts are always Bonderized.

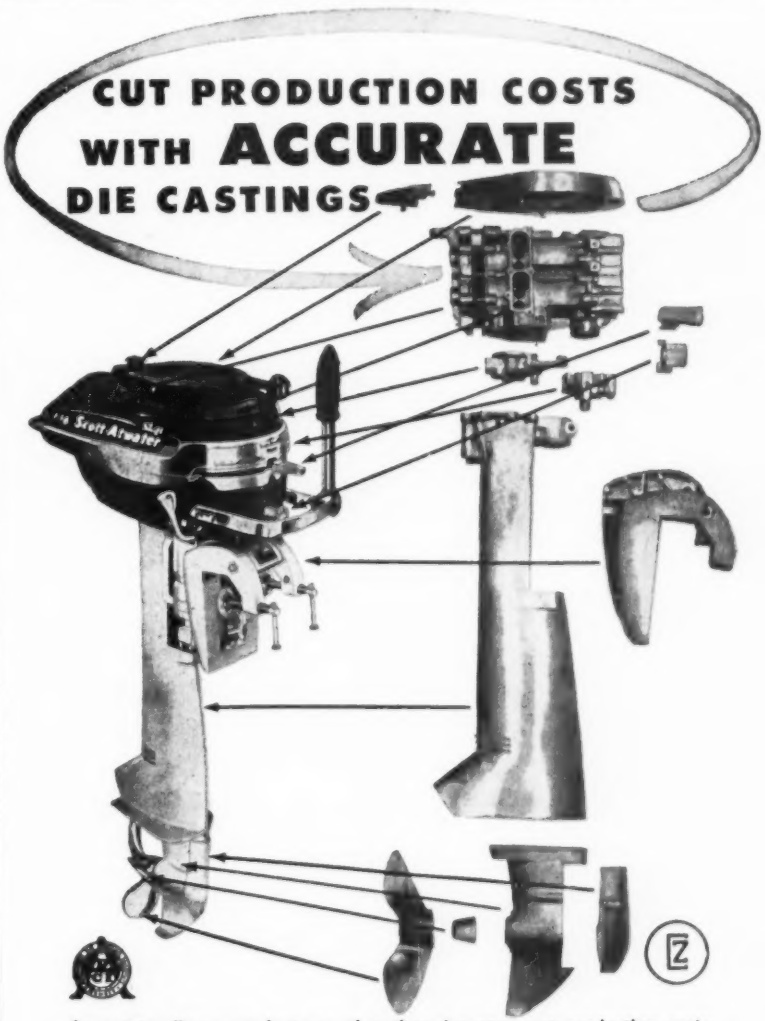
While this application is, perhaps, quite a specialized one it is possible that it may have applications on other powdered metal parts than the bushings described.

PLANT MANAGER NAMED

Indiana Die Casting Company, Inc. announces the appointment of G. N. Fitzgerald as plant manager, effective October 5, 1953.

MAG DIE CASTINGS
continued from page 43

Smaller home portable tools with magnesium die cast frames have been in service for about three years without incident. In this particular field, aluminum appears to be more competitive. The weight saving effected by the change



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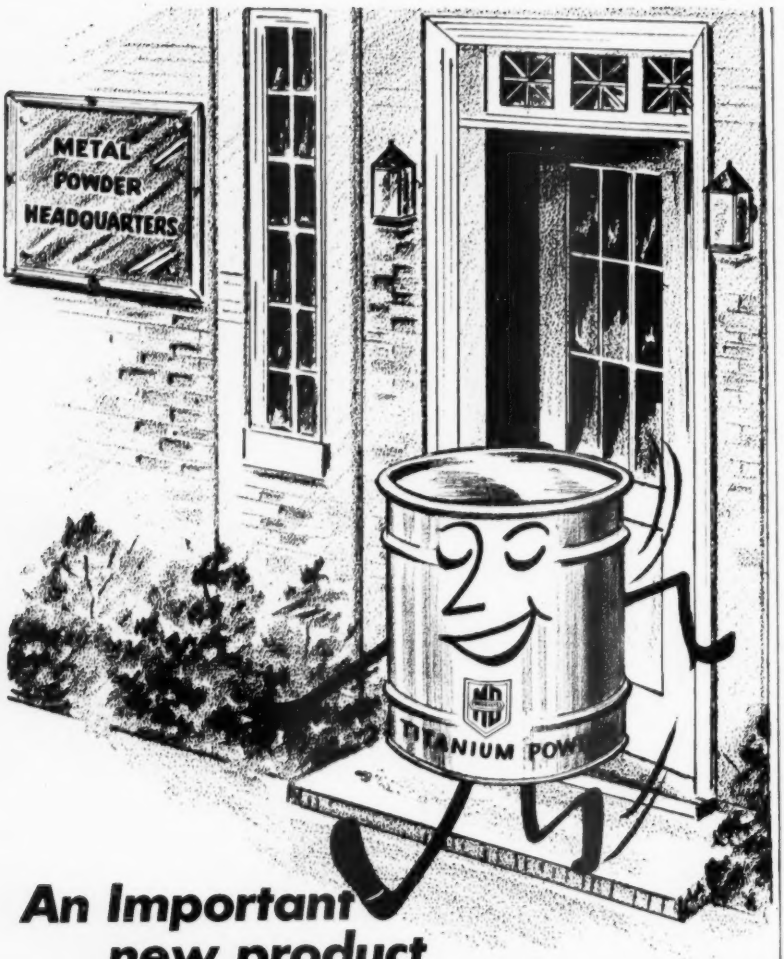

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A new product of outstanding importance is now emerging from Metal Powder Headquarters—

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Corrosion resistance
Durability
Machinability
Mechanical properties

If Titanium Powder or other Metal Powders are of interest to you—consult with MD at Metal Powder Headquarters—where "one call does it all." The recommendations of the MD Sales Service Department are available without obligations.

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SUBSIDIARY OF AMERICAN-MARIETTA COMPANY

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to magnesium does not appear to be sufficient to offer a sales advantage. This includes portable sanders, electric saws, impact drills, and small electric hand drills. The larger industrial versions of these tools appear to be well established in magnesium, but their volume so far does not warrant the die casting process.

The automotive industry is today the largest consumer of die castings, taking well over half of the die castings made. One leading automobile manufacturer has been carefully testing magnesium die castings as an alternate material in both decorative and semi-structural applications. Decorative parts, such as steering column shrouds, brackets, or spacers, as well as instrument parts, such as a clock bezel, are completing their third year in production without any returns from the field and without production difficulties.

Such parts are decorative and require good surface finish. For example: two shrouds bolted together serve as a housing for the steering column. Surface preparation consists of polishing the parting line and removing any surface defects, followed by the chrome-pickle chemical surface treatment. These parts are then given two coats of synthetic enamel which is subsequently baked. Great care is used in degreasing before painting as a primer coat is seldom used and the adhesion of the enamel to the chrome-pickled surface is dependent mainly on the cleaning cycle.

Automotive castings classed as semi-structural, such as clutch housings, require maximum internal soundness and freedom from surface defects in stressed areas, to insure long life. In addition to the strength requirement, torque converter housings must hold oil pressure and generally re-

quire impregnation. These parts are finished with a single coat of paint applied to the untreated magnesium. Exposure to road salt in daily use over a period of three years has not resulted in any detrimental corrosion.

At least 10,000 magnesium clutch housings are in service and several hundred torque converter housings have been in service for 1½ years with no returns. Slightly over three years' experience on experimental cars with magnesium clutch housings and torque converter housings is available, but these models were equipped with sand castings.

Other transmission parts which require wear and are in contact with oil as well as with the atmosphere, have been in service for the same length of time without encountering any difficulties.

Over a two year period, close to three million clutch pistons were assembled into automatic transmissions. These parts operate in oil and are required to withstand hydraulic pressure. Machining of these parts was outstanding, and despite the fact that deep grooves were machined in the castings for piston rings, rejects for defects uncovered in machining were far lower than in aluminum.

As to future applications, it is believed that transmission extensions, clutch housings, converter housings, automatic transmission valve castings, and decorative parts will be entirely satisfactory in magnesium. In fact, it appears that any aluminum part now being used for automotive application can be transferred to magnesium, except those which are in contact with water or with brake fluids.

On the subject of wear, it is a matter of record that the sharp edges of mating parts have a tendency to broach magnesium. For example, a small valve piston operating in a magnesium casting may

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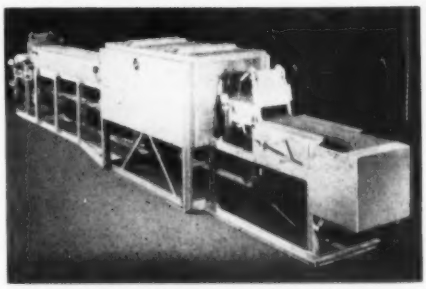

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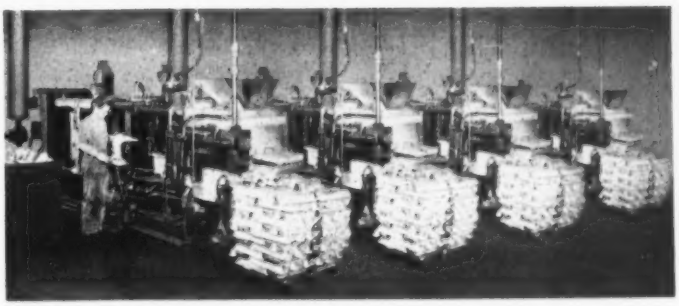

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The combination of skilled craftsmen and a modern completely equipped tool room at FEDERAL contribute to making dies that help produce castings of superior quality.

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For additional information Circle No. 67 on the Reader Service Card

show greater wear than it would an aluminum. Parts requiring such wear resistance to compete with anodized aluminum may receive some help from the newly developed electrolytic coatings such as the HAE process. However, this has yet to be established.

The automotive industry is purchasing magnesium almost entirely on the basis of price, and it appears that as long as the metal remains competitive, it will be used in increasing quantities. It is gratifying to the magnesium die caster to know that magnesium has been established in so many automotive applications as a satisfactory alternate material.

Household appliances

In the field of household appliances, there is almost 20 years' experience in the use of magnesium die castings in vacuum cleaners. This is probably the oldest large scale use of magnesium die castings on record. Floor tools for the newer tank-type cleaners have also been in use for almost eight years.

Motor housings for kitchen mixers were made in magnesium for two years. Though there appears to be no advantage in these parts over aluminum, their performance has been watched with interest, as it is not a normal application for magnesium and the requirements have been satisfactorily met.

Business machines

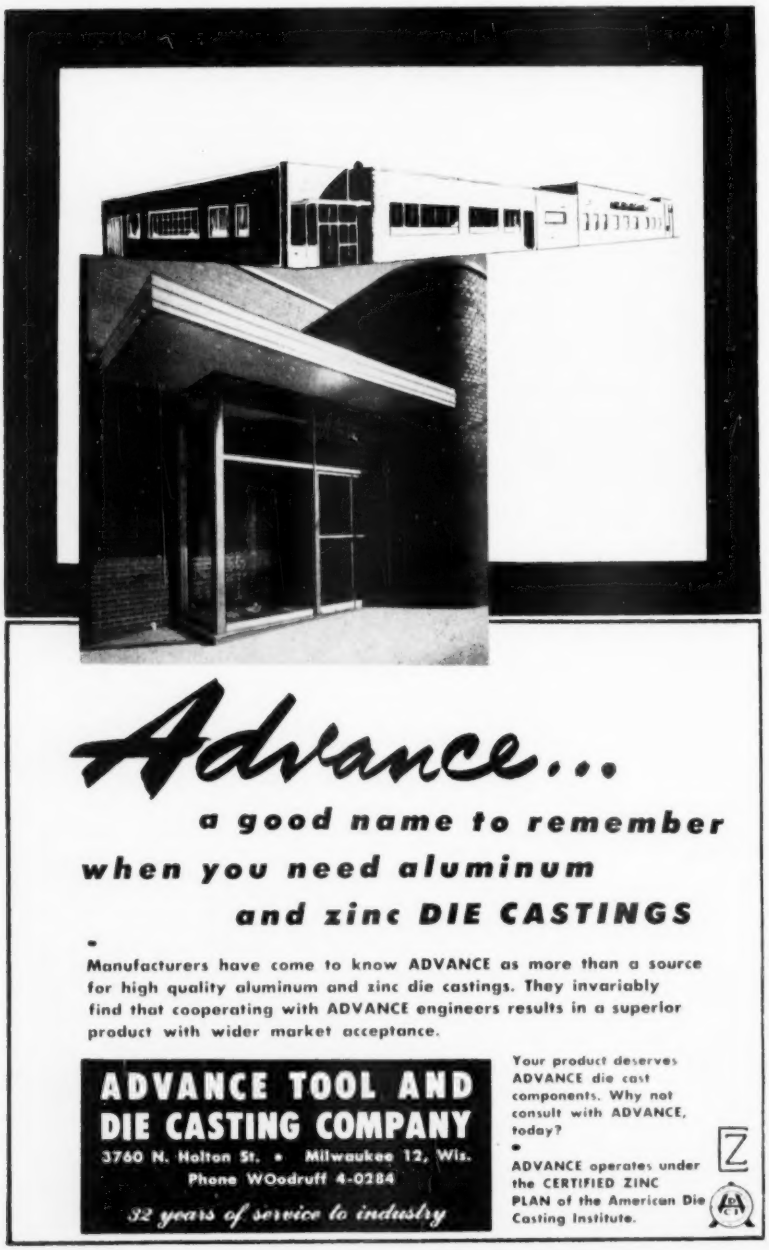
Magnesium is well established in the business machine field, including typewriters, calculators, recording, and dictating machines.

Semi-structural parts such as power frames, and side frames of electric typewriters have been in service as long as five years, while the outer housings and top covers have satisfactory service experience dating back 13 years. At least four typewriter manufacturers were using magnesium die castings as regular production parts during the past four years. One manufacturer reports that there has been no evidence of failure or field dissatisfaction resulting from the use of magnesium power frames or case parts.

Whether or not the present favorable economic conditions for magnesium continue, we can be very thankful that we have had an opportunity to see magnesium put to the test and come through with flying colors.

DESIGN CORPORATION FORMED

Sundberg-Ferar, nationally known industrial design firm which was formerly operated as a partnership by Carl W. Sundberg and Montgomery Ferar, has announced its incorporation as Sundberg-Ferar, Inc.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Can You Use the Advantages of

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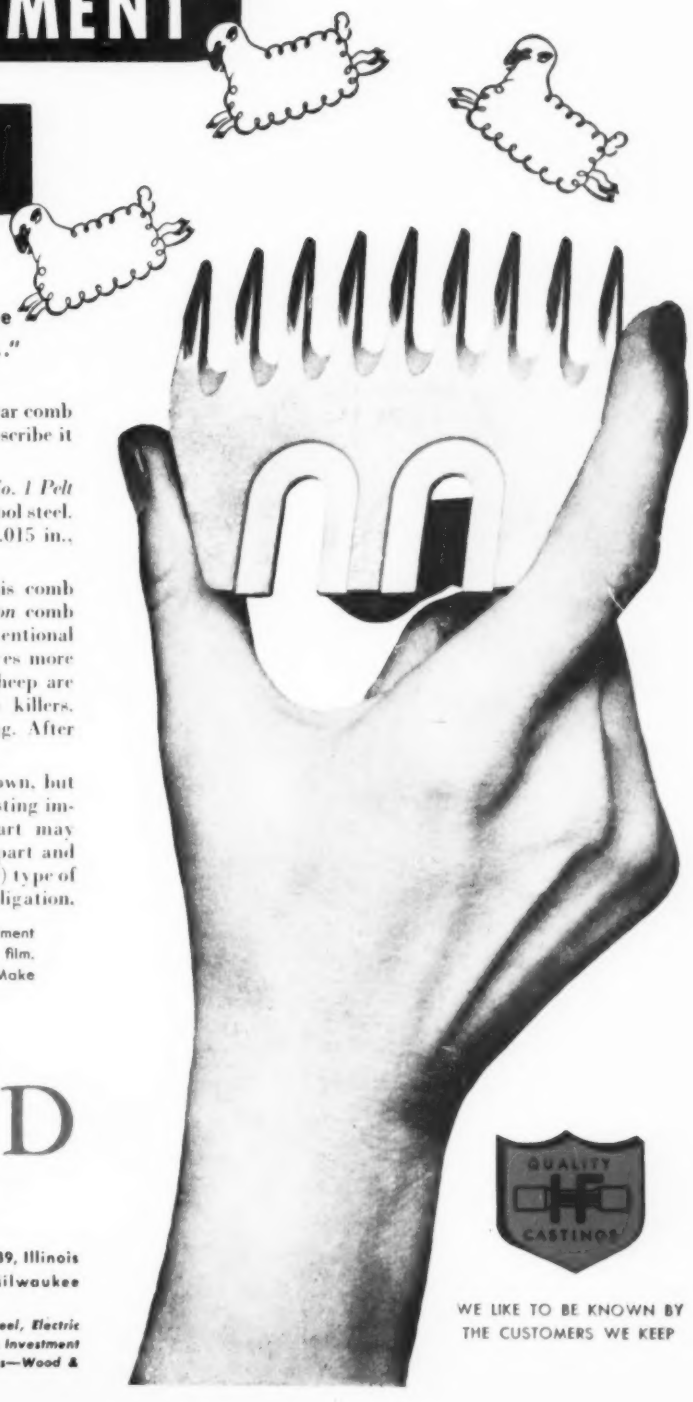

"The Miracles of Ultra Modern Metallurgy Have Touched, at Last, the World's Oldest Industry..."

When the sheep shearing industry tested this new shear comb last year, the industry's press used superlatives to describe it as is apparent from the above quote.

This is a Howard investment cast *Healy-Hudson No. 1 Pelt Shear Comb*, the first of its kind. It is made of 52100 tool steel. It has nine teeth with as-cast blade thicknesses of .015 in., almost knife-sharp.

There are many profit advantages in having this comb investment cast by Howard. This new *Healy-Hudson* comb has sheared 284 sheep before resharpening. Conventional combs become dull within 20 shearings. It also leaves more wool more evenly than any other comb. Sheared sheep are thus protected from Wind and Wet, both sheep killers. Number one pelts also develop faster after shearing. After trial use, sheep shearers have insisted on buying it.

This application may be far removed from your own, but it's a good example of how Howard's investment casting improves products to help increase profits. Your part may benefit, as well. To find out, send a drawing of the part and a sample, if possible. Tell us (1) quantities required, (2) type of material and (3) permissible tolerances. There's no obligation.

WRITE TODAY on your business letterhead for Investment Casting by Howard—a 12-minute 16 mm. color sound film. Give date desired, an alternate date and size of group. Make film dates as far in advance as possible.

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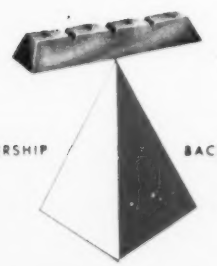

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